MECHANICAL HANDLING

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MECHANICAL HANDLING IN FRANCE

WITH A REVIEW of the 8th Materials Handling Exhibition in Paris appearing in this issue as reference, and judging from official statistics published concurrently with the Exhibition, there would appear to be little doubt that the French mechanical handling industry has made remarkable progress in the last few years. With Great Britain's Seventh International Mechanical Handling Exhibition, which is organized by this journal, now only six months ahead, it would seem timely to make brief reference to the organization behind the French industry which undoubtedly has contributed a great deal towards its success.

There are two manufacturers' associations, one for Lifting and Handling Standard Equipment and the other the National Association of Industrial Equipment. A body of technical advisers in material handling technique to advise manufacturers has also been formed.

An information centre on material handling has been set up by the manufacturers themselves for the purpose of advising users on the availability of mechanical handling equipment. The two associations of manufacturers make use of the information centre which has at its disposal a team of specialists who are prepared not only to give information but to make an 'on site' study of a potential user's particular problem and to give advice accordingly. Alternatively, the information centre will direct an inquiry to a consulting engineer.

The information centre also organizes exchange visits between manufacturers by their representatives with the object of exchanging ideas and 'know how' to the benefit of all concerned. As certain competition exists between French manufacturers, as indeed it does in most manufacturing countries, it is difficult to determine exactly how such a policy operates. There is, in fact, a significant lack of information in regard to this matter.

Another activity of the information centre, and one which is both interesting and of considerable importance to the industry, is a policy of encouragement to the technicians and engineers of the future. In one form this is being done by commencing, in conjunction with the General Board of Technical Education, a curriculum that has been devised for the purpose of teaching apprentices and students. A materials handling prize has been created which is intended for students of technical education.

France together with Great Britain and 11 other European countries are members of the Fédération Européenne de la Manutention or in short the F.E.M. This federation, founded in 1953, brings together through the medium of national committees the mechanical handling equipment manufacturers of all the European countries concerned. It has carried out valuable work in such matters as the interchange of information, standardization, and the establishment of safety standards between the countries. Some appreciation of the valuable work being carried out by this organization can be obtained from the brief report on the 7th Congress which also appears in this issue.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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12·5-TON FLOATING CRANES FOR BULK HANDLING

By K. Schmoll

THE handling equipment at Hamburg harbour has been extended by two new 12·5-ton floating cranes for grabbing duties. These cranes are notable for their extremely accurate automatic weighing equipment. The installation of this weighing equipment necessitated special design measures to be taken, and included the provision of additional devices for the weighing equipment, to eliminate the deleterious effect of the pontoon's heel.

The floating cranes were built for Getreideheber G.m.b.H. in Hamburg by DEMAG A.-G., Duisburg (cranes) and Hanseatische Werft G.m.b.H., Hamburg (pontoons). The weighing equipment was supplied by Essmann & Co., Hamburg-Altona.

Handling Tasks

The grabbing floating cranes are primarily employed to handle bulk goods, such as ore, coal, phosphate, fertilizers, etc., which play an important role at Hamburg harbour. They can be used to advantage in the case of ships, where bulk goods form only part of the load. The floating crane is moved to the ship, which need not leave the quays destined for the handling of cargo. While the cargo is being handled on the land side with the help of quay cranes, grabbing floating cranes simultaneously load the bulk goods into barges. The use of floating cranes reduces demurrage as well as the harbour dues to be paid. In addition, very considerable costs can sometimes be saved on the warping or towing of sea-going vessels.

Floating cranes as 'handling helpers' can be employed at the ship's berth in the harbour, for example when the loading and unloading of ships by transporters is to be accelerated. As the grab can be exchanged for hook slings in a minimum of time, the floating cranes are also suited for assisting quay cranes in cargo-handling, particularly for lifting cargo weighing up to 12·5 tons, which is too heavy for the usual 3-ton harbour cranes.

Balancer design

The demand that weighing equipment attestable by the standards department should be installed determined the selection of the jib system. Instead of the double-guide level-luffing slewing crane design, by which the appearance of heavy portal or floating cranes is usually characterized, a balancer-type design was selected (Fig. 1), in which the weighing equipment can be installed more easily and at lower cost than in the case of the double-guide level-luffing crane.

In a crane having a simple jib without rope equalizing system, the load rises when the jib is retracted and goes down when the jib is extended. This phenomenon is eliminated in the case of the balancer-type crane (Fig. 2), as the balancer L, with the rope pulleys O, shortens the rope length between the sets of pulleys E and Q when the jib is retracted. By the suitable dimensioning of the balancer, an almost horizontal movement of the load during the luffing process can be attained. A second pair of struts D, running parallel to the jib F, as well as the arrangement of the points B-C-H-I in the shape of a parallelogram, keeps the platform horizontal in all jib positions, so that the necessary prerequisites are available for the installation of weighing equipment.

Fig. 3 shows the top of the jib with the platform A serving as walkway and the two sets of pulleys B and C; on the left-hand side the jib F with the compression member

Fig. 1. *12·5-ton balancer-type grabbing floating cranes, with automatic weighing equipment*

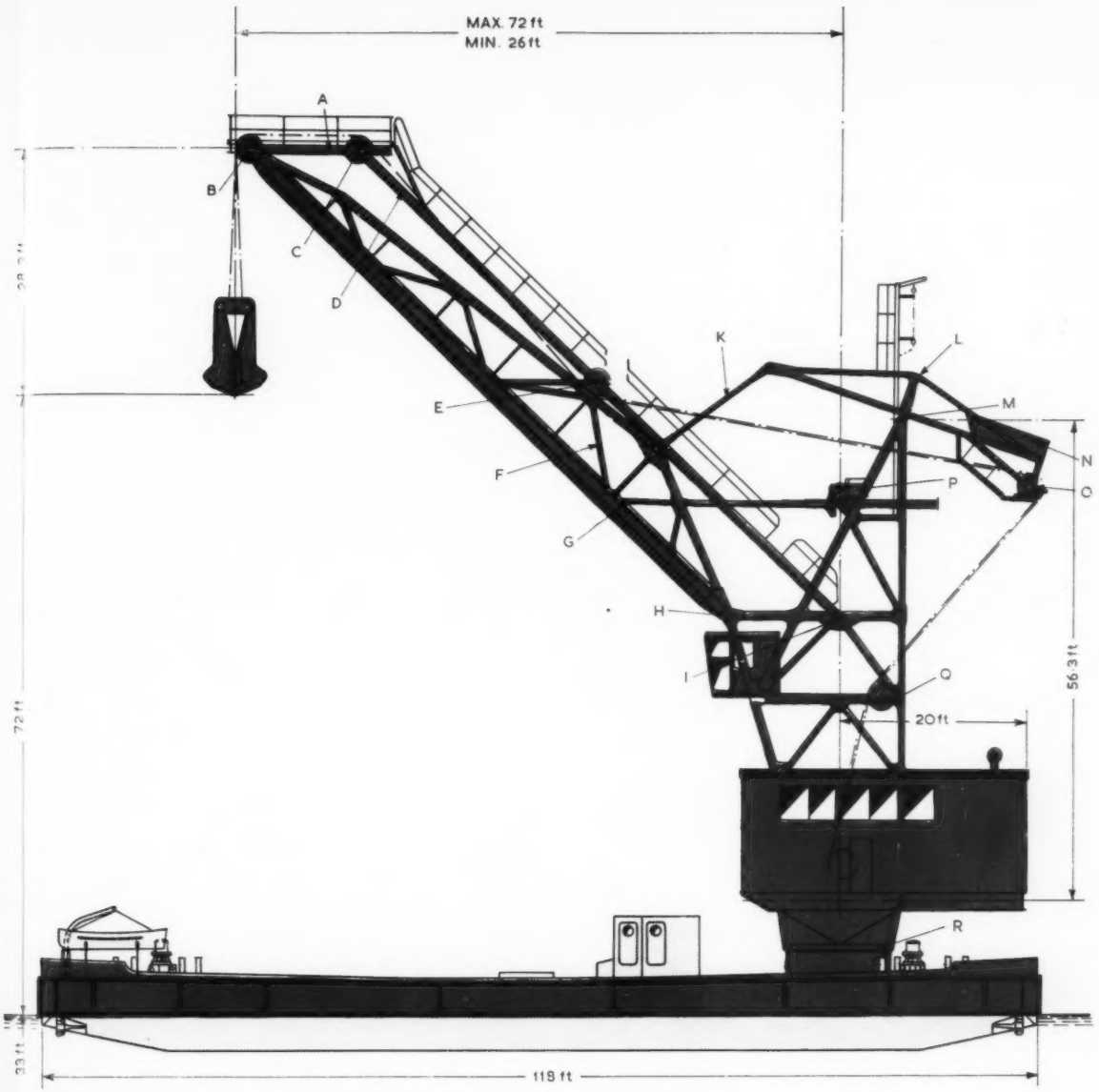

Fig. 2. General layout drawing:

KEY
A Platform at jib head
B Jib-head pulleys
C Rear guide pulleys
D Struts, parallel to jib, for keeping platform horizontal
E Guide pulleys
F Jib
G Compression member of weighing equipment
H Attachment of jib (F) to crane structure and of compression member (G) to beams of weighing equipment
I Attachment of struts (D)
K Connection rods between balancer and jib
L Balancer
M Attachment of balancer
N Moving counterweight
O Guide pulleys
P Screw-type luffing mechanism
Q Guide pulleys
R Slewable connection by double-row ball-race slewing rim

G can be seen, on the right the struts D, running parallel to the jib, serve to keep the platform horizontal. The compression guide in the platform is hidden behind the structural steelwork.

As is shown in the illustrations, all parts of the machinery as well as the lubricating points are easily accessible by stairs; landings and ladders are provided with guards. At the extreme end of the balancer L, there is a counterweight N for balancing out the jib's deadweight Fig. 6. The balancer, which is pivoted in the superstructure M, is moved along by the two connection rods K when the jib is being luffed.

Operation of Weighing Equipment

For the rope-pull-operated weighing equipment, a compression member G, consisting of a lattice girder, has been provided, which is independent of the jib's F, structural steelwork Fig. 4. The axles of the guide pulleys at the front B are supported by this compression member and by the upper compression guides located in the platform A. The bottom end of the compression member is supported in the weighing direction at point H in the lower compression guides. This arrangement ensures that a measurable vertical force, equal to the force of the load at the jib-head

4

3

Fig. 3. Platform at jib head

Fig. 4. Below the structural steelwork of the jib, the lattice-work of the compression member for the weighing equipment can be seen

Fig. 5. The bay-window-type operator's cab affords an all-round view. Above it in the centre, the attachment of the compression member to the weighing equipment can be seen; on both sides, the attachments of the jib to the crane structure

pulley B becomes effective at point H; this is shown in Figs. 7, 8 and 9 which illustrates the distribution of the forces.

The resultant is obtained from the total load q consisting of the weights of the grab bucket contents, the buckets themselves and the four rope strands, as well as of the rope pull, s, as is shown in Fig. 7. Fig. 7 shows the distribution of the forces at the jib head B at a jib position $\alpha = 60$ deg. The resultant r can be resolved into two components; a horizontal one, a, which is diverted via the upper compression guides into the steel structure of the platform A, and a component g, the direction of which is always in accordance with any of the jib positions. The latter force is carried to point H via the compression member G. Its horizontal component is conducted into the steel structure via the lower compression guides. Only the vertical component, which is equal in value to the load q, is measured by the weighing equipment.

Fig. 8 shows the conditions prevailing at a jib position of $\alpha = 75$ deg; although the values of the a and g components are different, the value q measured at point H, which is the crucial value, remains the same.

As already mentioned, this applies only to the presupposition that the platform A remains horizontal in all jib positions. If this were not the case, a vertical component q', as is shown in Fig. 9, would develop at point H and be different from the q value to be measured.

To make the weighing equipment function properly irrespective of the height of the grab, it is imperative to eliminate the influence of the suspended rope strands, the weight of which changes with the height of the grab. An equalizer has, therefore, been built in, which is positively controlled by the rope drum of the grab hoist. The differences in weight of the rope lengths in the various jib

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Fig. 6. The balancer-type design ensures a horizontal movement of the load

positions, which result from the operation of the balancer, are also compensated for by a special device, as is the influence of the pontoon's heel.

An automatic weighing machine installed in the operator's cab enables the weight of the load to be read and recorded with an accuracy of approx. 10 lb. The automatic weighing machine is equipped with a tare weight beam for balancing out the deadweight of either the grab or the hook sling, so that only the weights of the bulk material or cargo being lifted are measured, recorded and summed up.

Double-row Ball-race Slewing Rim

The slewable connection R between the pontoon and the crane is formed by a double-row ball-race slewing rim, which takes up not only the compressive but also the tension forces and is, therefore, capable of transmitting tilting moments. A torsion-resisting tray made of welded plate forms the transition between the upper half of the ball race rim and the platform, Fig. 10. The stationary part of the ball-race slewing rim is supported on the pontoon in a frame, which is also welded of construction. This frame contains the slip-ring assembly for feeding current to the various consumption points in the pontoon.

Machinery House and Drives

A spacious machinery house with a floor area of 33 ft × 23 ft, and a height of 13 ft is mounted on the platform and accommodates the grab hoist, the slewing mechanisms, the electrical equipment and the diesel-electric power station.

The two standard slewing mechanisms have a three-reduction spur gear unit, in which the wheels of the first two steps have helical teeth. A vertical flanged motor serves as drive. The output pinion engages the inner gear of the ball-race slewing rim.

The grab hoist is a self-contained winch with planetary gear unit and two motors, which affords the well-known advantages of the type—namely, simple control with the help of one lever only for both lifting/lowering and opening/

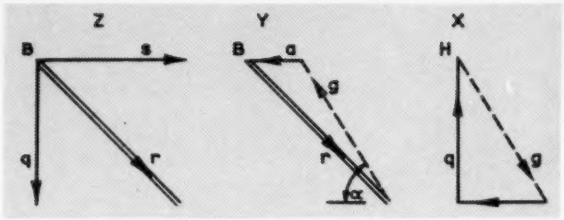


Fig. 7. Distribution of forces at the jib head (y and z) and at the lower end of the compression member (x), at a jib position of α = 60 deg

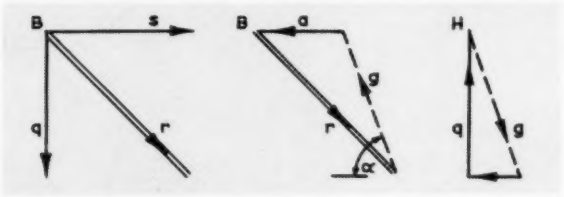


Fig. 8. As Fig. 7 but at a jib position of α = 75 deg

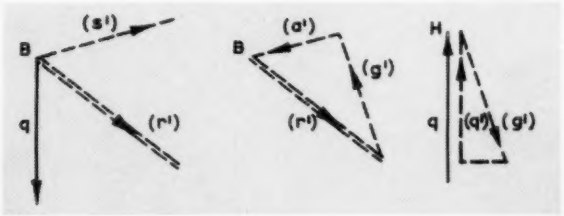


Fig. 9. The slightest deviation of the platform A from the horizontal position would result in wrong readings of the weight; the vertical force q' measured at the bottom end of the compression member would then have a different value from the load q

Fig. 10 (right). The slewable connection between the pontoon and crane consists of a double row ball-race slewing rim

Fig. 11 (below right). Screw-type luffing mechanism in the superstructure

closing and simultaneous performance of the two operations.

The screw-type luffing gear P is mounted on universal joints in the superstructure (Fig. 11); the connection between the screw and the jib is also a universal joint. The drive is effected by turning the nut of the screw. The screw is protected from atmospheric by a telescopic tube.

Bay-window-type Operator's Cab

It is located 33 ft above the pontoon (Fig. 5) and affords a good view of all operations. The crane operator sits in a convenient control chair with levers on both sides; with the help of the levers he effects the two grab movements as well as the crane's luffing and slewing movements via master controllers. The cab houses the automatic weighing equipment, the jib position indicator and the indicator showing the heel of the pontoon.

Diesel-Electric Power Station

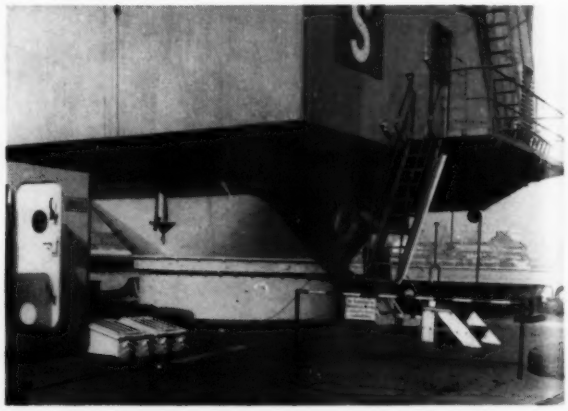
The diesel-electric power station is located in the rear extension of the machinery house and comprises a 415 PS diesel engine coupled with a 440-V 230 kW D.C. generator, and exciter and an amplidyne generator. The pontoon, which is not self-propelled, can be moved by a tug.

Carrying capacity and dimensions

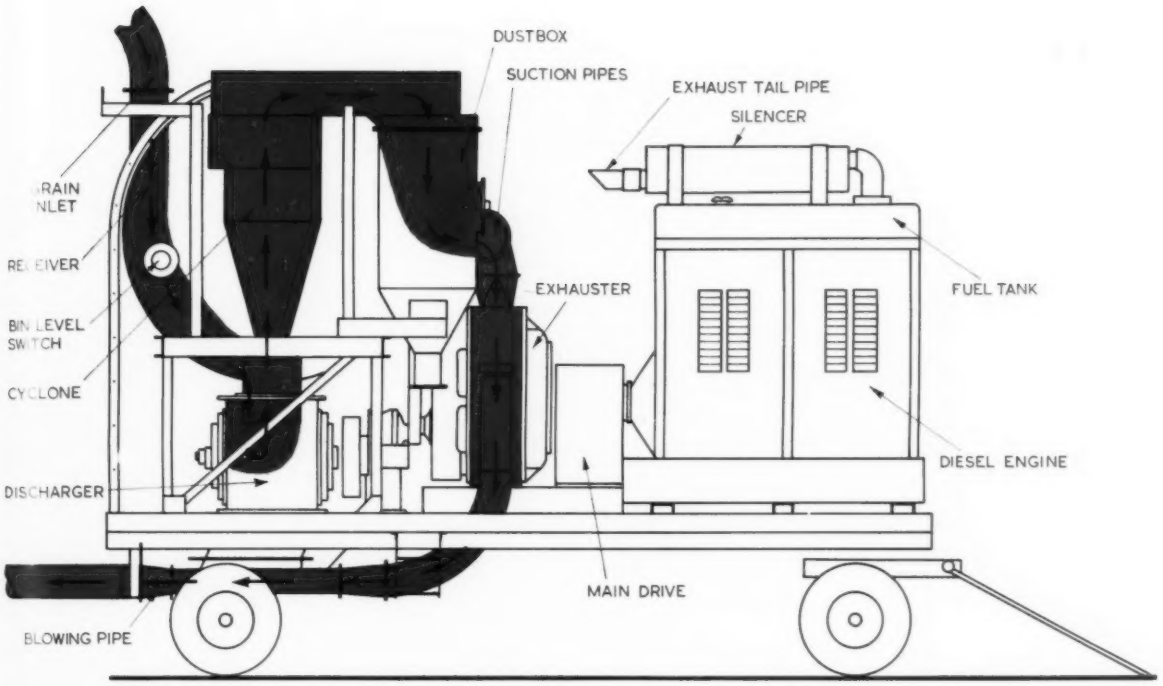
Carrying capacity (grab bucket + contents)	12·5 tons
Maximum radius from crane centre	72 ft
Minimum radius with grab bucket opened	41 ft
Minimum radius with grab bucket closed and for cargo handling	26 ft
Height of lift above water level	72 ft
Height of lift below water level	33 ft
Pontoon	118 × 48 t
Maximum heel	2 deg

Working speeds and drives

	Hoisting	Closing	Luffing	Slewing
Working speeds ft/min.	195	165	195	1·3 r.p.n
Drives kW	145	72	35	2 × 18



MOBILE PNEUMATIC HANDLING PLANT



Outline drawing showing main items and flow of grain

A DEMONSTRATION was given recently by Spencer (Melksham), Ltd., of a mobile pneumatic handling plant which has been constructed to a new design. It has been produced to meet the demand for a handling plant of moderate capacity and has a rating of 50 tons per hour. The capacity rating is specified for when handling wheat or *pro rata* for other similar materials and when the intake nozzle is sinking vertically and the material flowing freely, the intake pipe being 100 ft long, including a vertical direct lift of 50 ft with one bend and the delivery pipe 100 ft long laid horizontally with not more than one bend.

The complete plant is mounted on a sprung 8-wheel trailer specially constructed for the purpose and fitted with six hand-operated jacks. The outside dimensions of the complete plant have been kept within limits of width and height laid down in the Ministry of Transport regulations. Its overall height is 14 ft, width 8 ft, length 18 ft 11$\frac{5}{8}$ in, and wheelbase 14 ft 5$\frac{5}{8}$ in. The maximum weight is 13$\frac{1}{2}$ tons.

Power is supplied by a Ruston-Paxman powerpack which incorporates a 4RPH, 160-b.h.p. high-speed diesel engine coupled direct to a twin plate friction clutch which is operated by a hand lever. 24-V electric starting and charging is provided. Where a mains supply is available an electric motor can be fitted in place of the diesel engine.

A large Roots-type air exhauster with twin impellers is fitted, the drive from engine to exhauster being by means of vee ropes. This method of drive has been adopted because of its greater flexibility compared with geared drive which allows for minor deflections in the main chassis which may occur when the plant is standing on uneven ground.

The combined grain and dust discharger provides an air seal necessary to maintain a partial vacuum within the system, while allowing material to pass through to the blowing side of the plant. It is fitted with separate inlets for the main grain stream from the receiver and for dust from the internal cyclones. The discharger is driven through a slipping clutch designed to operate a warning system if a foreign body becomes jammed between the rotor and casing.

The grain receiver has been specially designed so as to give ample capacity while keeping within the overall height available for the plant. To achieve this the normal cylindrical receiver has been mounted on its side. The grain inlet, which can be moved through 360 deg to whichever position suits the particular operation, is located at the

View of the plant from exhauster side. Engine covers have been removed

highest point of the receiver. Grain enters the receiver tangentially so that separation of the larger dust particles is facilitated.

A high efficiency cyclone is built into the side of the receiver and delivers dust to the separate dust inlet of the discharger. As a safety precaution against the possibility of material from the cyclone being drawn over into the exhauster, an air receiver containing a fine mesh filter is fitted in the pipeline from the cyclone. Material accumulating in the bottom of the air receiver can be removed through an easily accessible door.

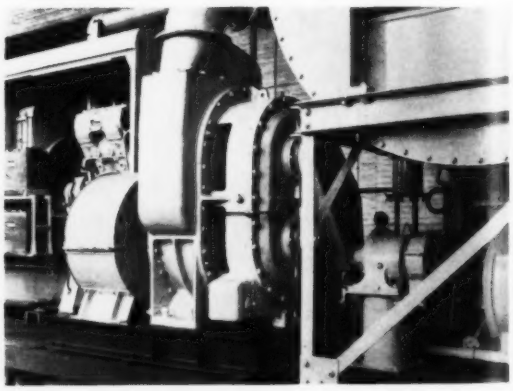
There is an instrument panel which houses indicator lights for engine oil, exhauster oil, discharger clutch, level switch and battery. Beneath these indicator lights are mounted a vacuum gauge and an air pressure gauge. Alongside the instrument panel is a main switch which must be switched on before the engine can be started, the orange light, marked battery, on the instrument panel indicates when this main switch is on.

When the engine is switched on a klaxon sounds and the red indicator light on the panel lights up until the engine oil pressure builds up to about 30 lb/sq. in. When this pressure is reached the klaxon stops and the red light goes out unless and until the oil pressure again drops below the prescribed figure.

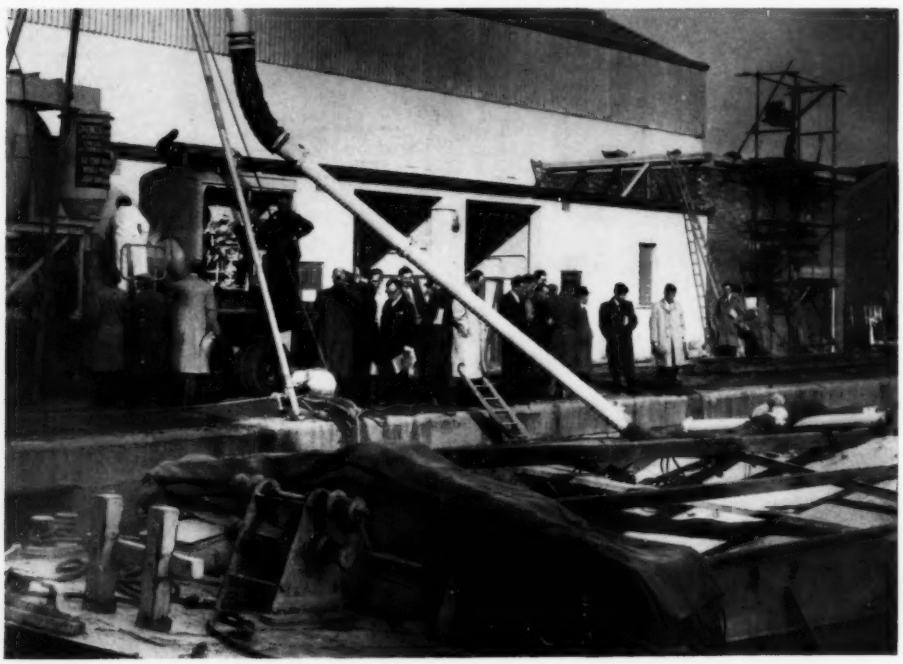
With the clutch disengaged, a switch operated by the clutch lever isolates all parts of the warning system except that linked with the engine. When the main clutch operating the drive to the exhauster is engaged and the exhauster starts, the warning horn and red-light system again operate until the oil pressure has been built up in the exhauster gearbox. If a build-up of grain occurs in the discharger or receiver the warning horn and red-light system are brought into operation.

On normal working when discharging from a barge this plant can be operated with one man on the plant and another in the barge. An additional man may be necessary at intervals for trimming and cleaning up, etc.

Fuel consumption for this unit is approximately 8 gal/hr at full load.



Close-up view of exhauster showing drives to discharger



View taken during a demonstration of the plant unloading grain from a barge. Photograph 'The Western Daily Press', Bristol

WORK STUDY GROWING*

Where Work Study is applied, practical gains in lower capital needs, in improved production, reduced costs and higher quality of output are the rule. But while Britain does not lag behind in its knowledge of Work Study, the speed of application is far too slow.

By R. M. CURRIE, C.B.E.

President of the Work Study Society

IT IS OFTEN said that Britain's greatest resource is brains. This is as true in the field of Work Study as elsewhere, and our colleagues in other countries willingly agree that the Work Study techniques developed and available in Britain are second to none. But what we have still to do is to learn how to apply Work Study with the speed and intensity of the Americans, for example. In Work Study, as in other fields, there is little excuse for this country to lag behind in the race to extract the utmost in the form of goods and services from our resources—not only in brain power but materials and capital equipment as well.

If we study the international productivity indices, we find that according to recently issued I.L.O. figures our improvement during 1957 was only 1·7 per cent, against Japan's 6 per cent. True, labour productivity indices do not tell the whole story: they do not disclose the proportionate effects of new capital investment, process and product research, and so on. Again, our record may have been affected by government policies against inflation. But Work Study can make immediate contribution to higher productivity; and by helping to cut costs all round it works against inflation.

Let me quote an instance of all-round improvements that resulted from Work Study application to traditional methods of colour-mixing and matching in the manufacture of leathercloth. By the old method, the required colours for spreading on the fabric as it passed through the calenders—a form of rolling mill—were produced by the colour-strikers on the basis of past experience. Colour-mixing formulae were based on the customary traditional 'hit and miss' methods; hence, no accurate measurement of work was possible, and no proper incentive scheme could be arranged. With the assistance of Work Study, not only were precise technical formulae established for colour-striking, but reliable Work Measurement values were determined so that an individual incentive scheme could be introduced. The results can be summed up in terms of facts and figures as follows:—

Manpower changes	Nil
Batch increase	4 to 8
Reduction in labour cost ..	55 per cent
Cost of Work Study	£205
Saving (per annum)	£2,300

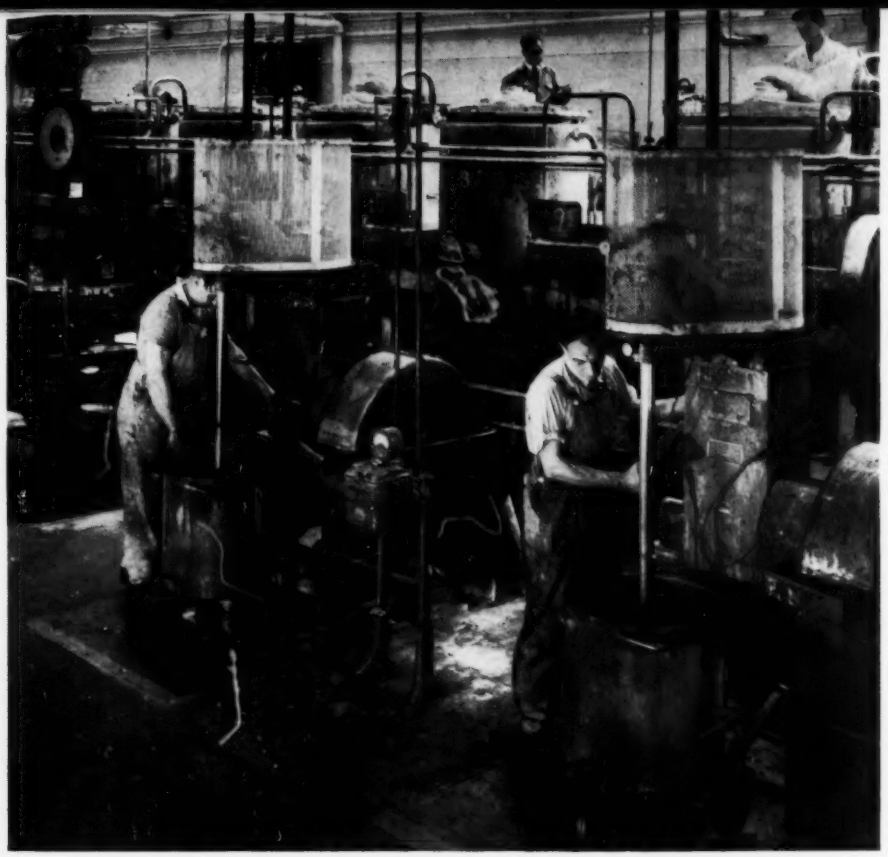
Convincing examples of this kind are coming forward now from widely diverse sources. The tradition is becoming well established of practical co-operation between Work Study specialists and the other members of the management team. The latest development of this co-operation has enabled the power of Work Study to exert real influence at the first conception of new plant design. It is now possible, for example, to forecast more accurately than before the number of men required to operate a plant before production starts, which has the double advantage of making sure that the actual jobs to be done are within the capacity of the men to be employed, and avoiding future redundancy by manning the plant at the proper level in the first place. The figures in the table cover five typical production plants and demonstrate first the discrepancy between traditional and Work Study estimates of manpower requirements, and, secondly, the effect of combined work, on these estimates when the Work Study department is brought in as a member of the team.

Bulk Loading

I have only space for one more typical Work Study result covering the loading of bulk crystalline material into ships. The organized critical examination of the study suggested that the use of open goods wagons was wasteful in money and manpower, and that it did not result in the loading speed and cleanliness required. The new method replaced the wagons by lorries and a steel skip was designed which could be lifted by twin hoists on the transporter crane on the ship's hold, tipped and then replaced on the lorry.

Detailed Work Study using this prototype skip demonstrated the best method of loading and discharging, the proper manning strength, and the most suitable type of lorry. Using railway wagons, eight men had been employed on filling at the works and seven on emptying the product into the ships; using the new methods which included a Work Measured incentive scheme—these teams were reduced to two and three men, respectively. A rate of 800 tons per shift was aimed at, but with two skip lorries available and no delays, rates of 1,200 tons have been achieved. The ships are loaded more quickly; there is appreciable saving on railway freight charges and demurrage charges on wagons have been eliminated; contamination of the product loading no longer occurs, locomotive power has been saved; no time is lost by the road vehicle drivers; and the ships are loaded with greater accuracy as to weight.

*Reprinted from 'The Financial Times Annual Review of British Industry 1959'.



Colour mixing and matching. This depicts part of the job described in the article. The coating compositions are prepared by mixing the ingredients together in these easily transported tubs.

The total savings are in the region of £15,000 per year. The scheme has now been in operation for over four years and a half a million tons have been handled in 70,000 skip-loads. There have been no driving accidents!

The examples given above underline the point that the present-day view of Work Study does not solely aim at the more effective use of manpower at shop-floor level. Against this view, we should set the opinion expressed by a distinguished industrialist in answer to a correspondent: 'It would seem . . . that you are under the impression that Work Study is primarily concerned with the operative, and more particularly with financial incentives for him. Whatever thinking may have been in the past, we have found the impact of Work Study travelling steadily away from the shop floor to the board room. We now regard it as symbolizing the analytical and progressive attitude of mind which is mainly concerned with making management manage better, rather than getting the workman to work harder'.

It is not possible to give national statistics indicating the increase in Work Study activity and effectiveness in recent years. The best way in which I can give an idea of the progress Work Study is making in Great Britain is to mention some recent developments which will be recognized by readers as significant:

1. The call for Work Study is ever increasing, and training facilities are constantly being extended to keep pace with the present demand for competent, properly trained personnel, who are in tragically short supply.
2. Several employers' organizations are providing a Work Study service to their members. Noteworthy, in view of the high proportion of British firms employing less than a hundred people, is the advisory service for small firms set up by the National Union of Manufacturers.
3. The intensity of Work Study training among the more progressive elements in the trade union movement, and the signing of national agreements between employers and trade unions on Work Study.
4. The incorporation of Work Study as an examination subject in the syllabuses of professional institutions of the highest repute; a recognition of the importance attached in many industries to Work Study as a vital ingredient in the training and development of candidates for higher management.
5. The splendid effort of the British Productivity Council in propagating the Work Study approach.
6. The widespread successful application of the techniques outside industry—to the Armed Forces, agriculture, the hospitals, to name but a few fields—which has helped to convince the waverers that still remain within industry.

However, there are still obstacles in the way of further progress. We can, we are told—and every Work Study man believes it—double our standard of living within 25 years. The price to be paid for this is that British management should abandon their veneration for production and control methods sanctified only by their antiquity. As the Duke of Edinburgh puts it: 'If anyone tells you that there is not a better way of doing something, he is either a supernatural being or a supernatural clot'.

Manpower Estimates

Total Numbers Required to Operate

Production	*Forecast*		
Plant No.	**Using Traditional Methods**	**Using Work Study**	**Actual**
1	27	13	14
2	66	13	12
3	65	43	43
	Combined Assessment by Technical Staff and Work Study Department		
4	48		44
5	12		12

THE MARKET LOADER

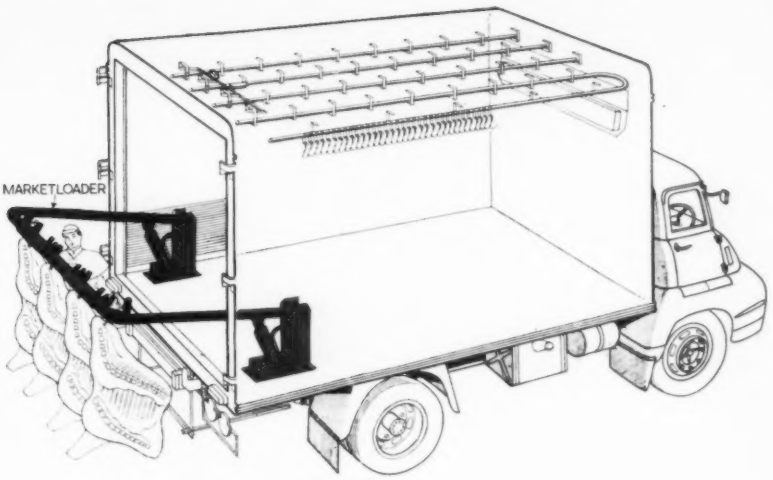


Fig. 1. Drawing showing the 'Market Loader' in its down and loading position

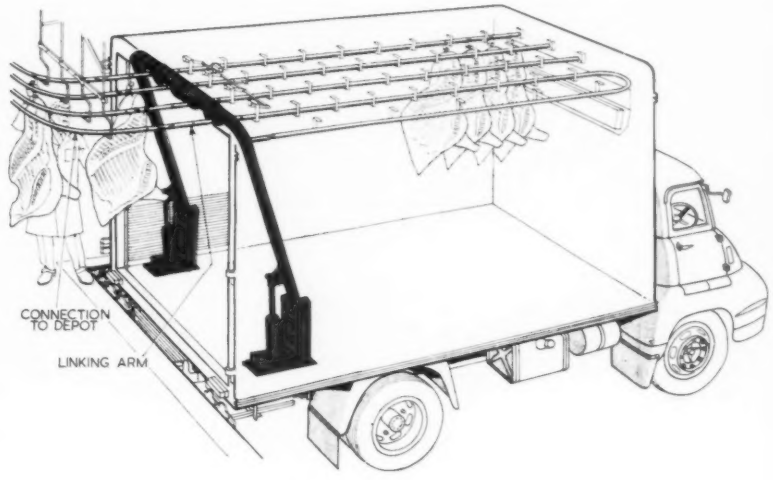


Fig. 2. Showing roof rails in vehicle connected direct to depot rails

To simplify loading and unloading meat when it is suspended from the roof in hang-up vehicles, an ingenious but simple device known as the Market Loader has been introduced by Walkers and County Cars, Ltd.

This device enables one man, the driver, to both load and unload the vehicle. It eliminates manual effort in the loading of meat vehicles completely and in consequence the risks of accident through slipping, when loading a vehicle by hand. It also eliminates the need to lift the load inside the vehicle and to drag the load to the rear of the vehicle, an operation which is the cause of a good deal of illness and many accidents among meat drivers.

With the Market Loader there is no need for the driver to enter the vehicle during loading or unloading, which decreases the likelihood of contamination from dirty boots. There is also a great deal less handling of meat, so that it is transported in better condition and the whole operation of loading and unloading is speeded up considerably.

The main beam is constructed in the form of an arch or inverted 'U' so that it may be used within enclosed vehicles. The standard arrangement is rated to lift loads from 1-10 cwt but heavier loads may be carried by making certain adjustments. As standard tipping gear components are used in its construction the matter of servicing is simplified and a low-cost method of loading goods of all types is provided.

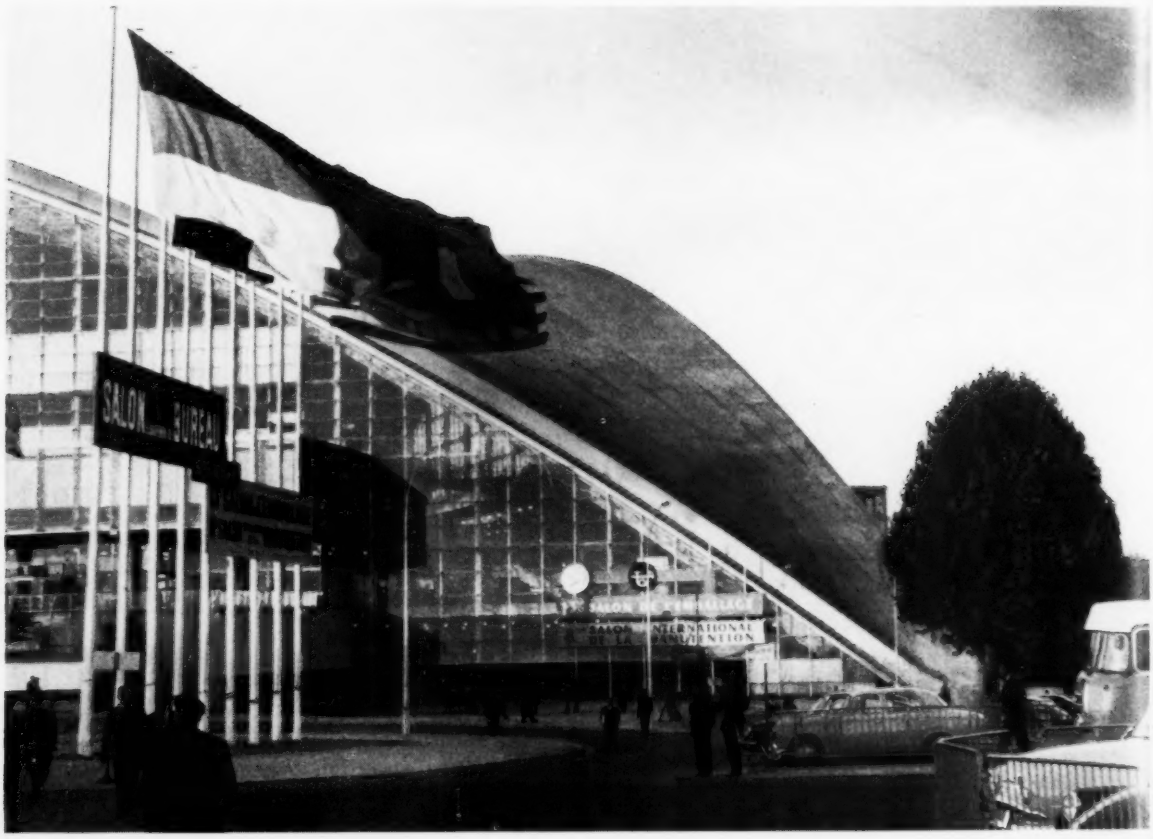
During unloading, the meat which is hanging from roller hooks in the roof of the vehicle is pulled back to the end of the roof rail by a pole and then on to a cup on the arch or beam. When the beam has been loaded it is lowered to shoulder height in a convenient position for the driver or porter to lift off the meat and carry it away on his shoulder. The reverse procedure is adopted for loading, when the meat is finally pushed to the front of the vehicle on its roller hook by means of a pole. There is a safety catch on the end of each roof rail which will not allow a hook to pass unless the beam is in the 'up' position, where by contact it trips a safety catch. This device ensures that meat cannot fall off the end of the rails at any time.

The beam of the Market Loader is hydraulically operated. The usual arrangement is for the hydraulic pump to be driven by an electric motor powered from the vehicle's battery. Hydraulic fluid is pumped to two rams mounted either side of the beam which, when extended, lift the beam from shoulder height to near vertical. Control is maintained by a two-way valve which has an 'up', 'down' and 'neutral' position. As an alternative arrangement it is possible to use a power take-off from the vehicle gearbox to drive the pump but the electrical verson is recommended because it gives a better time of operation and there are no engine fumes. It is claimed that there is practically no drag on the vehicle battery, what little there is being replaced by charging during normal running.

A further development associated with the Market Loader has been introduced in connection with a new fleet of Litex vehicle bodies which are also made by Walkers and County Cars, Ltd., and has been supplied to the Luton Meat Co. These have been specially designed so that the roof rails in the vehicles can be connected direct to the store rails, thus enabling the vehicles to be loaded and unloaded by pushing the carcasses on their roller hooks from the vehicle into the store and vice versa. The hooks on which the meat is suspended have been specially designed to suit both the vehicle and store rails. Meat which has been purchased in the sale room is pushed along the store rails into the appropriate vehicle ready for delivery. The Market Loaders which have been designed especially for this 'link-up' can be thrown in and out of position, which enables the driver upon arrival at a shop to unload a customer's meat single-handed when standing at ground level and as described previously.

PARIS MATERIAL HANDLING EXHIBITION

By C. E. Parnall, Technical Editor



AT THE CONCLUSION of the 2nd Congress on Materials Handling held in Paris in October and which was organized by the Centre d'Information de la Manutention, there followed the 8th International Material Handling Exhibition. This was the second time that the new building of the C.N.I.T. (National Centre of Industries and Techniques) had been used for a display of lifting and handling equipment but on this occasion all five floors of the huge building were in use at the same time. In addition to the Material Handling Exhibition, there was held the 13th International Exhibition of Packaging and Advertising, and the 10th International Exhibition of Office Equipment.

Fig. 1. Entrance to the section of the vast C.N.I.T. building which was allocated to mechanical handling. Two other exhibitions were held at the same time.

Over 25 per cent more floor space was allocated to exhibits compared with last year's show and more than 400 companies, the majority French, took part. British equipment, either imported or made in France under licence, was to be seen in most sections.

Fork lift trucks, tractors and associated types of vehicles appeared to predominate at the exhibition and there was a very strong representation by manufacturers of conveyors.

Fig. 2. A small 4-wheel tractor (in foreground), made by Jourdain Monneret, is available with two different gear ratios. Designated TMU3 it will handle a maximum of 4·5 tons, and TMU5, 7 tons. This company also exhibited Esslinger fork trucks.

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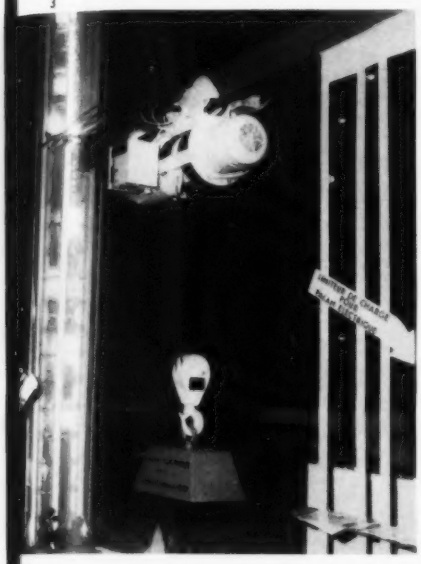

Fig. 3. One of the outstanding features on the Fenwick stand was the application of remote radio control to their overhead hoist.

Fig. 4. The display of Teleflex products by Lionel Duport et Cie, in Gt. Britain the products of Teleflex Products, Ltd.

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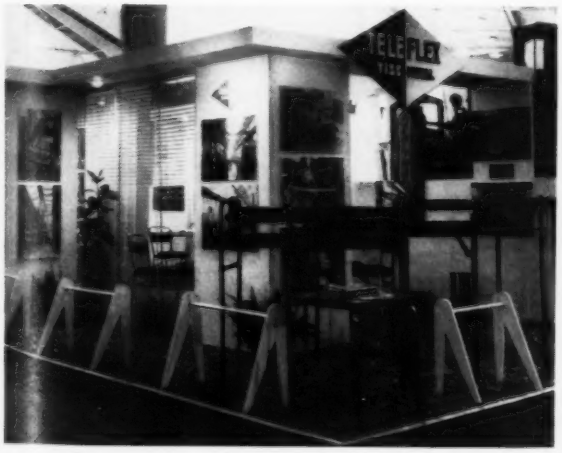

Fig. 5. A view from above of the Berthelat & Fils stand showing the large display of a Geo. W. King overhead conveyor which traversed the entire stand.

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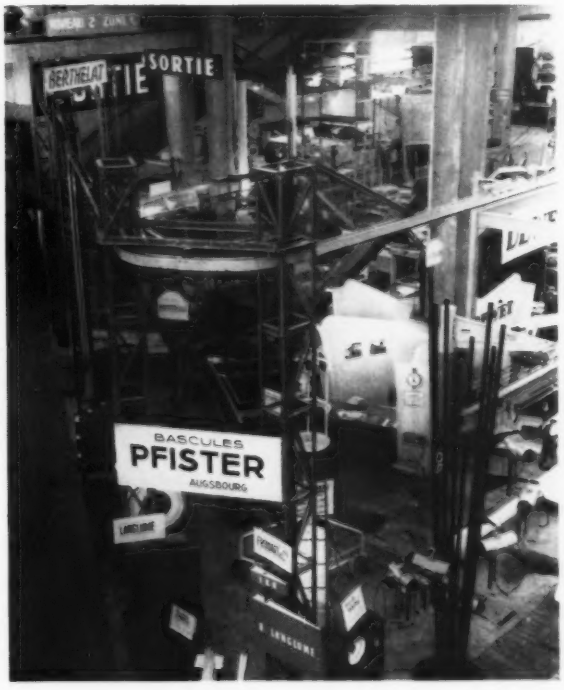

particularly of the transportable type, and metallic conveyor belting. Judging from the comprehensive display at this exhibition, there can be little doubt that considerable effort and progress has been made by French manufacturers of handling equipment in recent years, so that they are now in a position to offer products that compare favourably both in design as well as quality with those of other countries manufacturing similar equipment.

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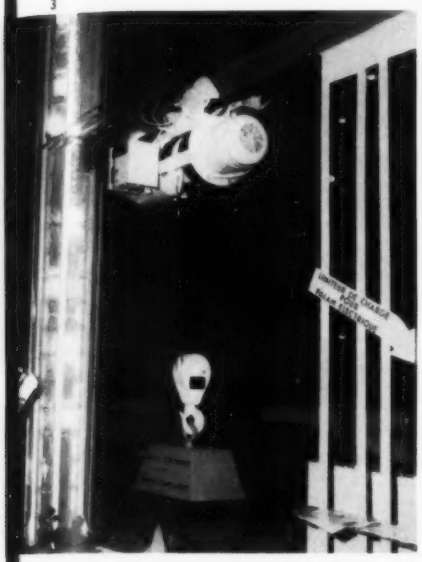

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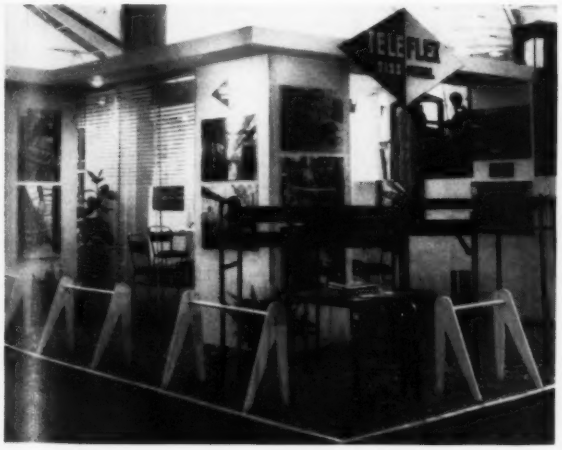

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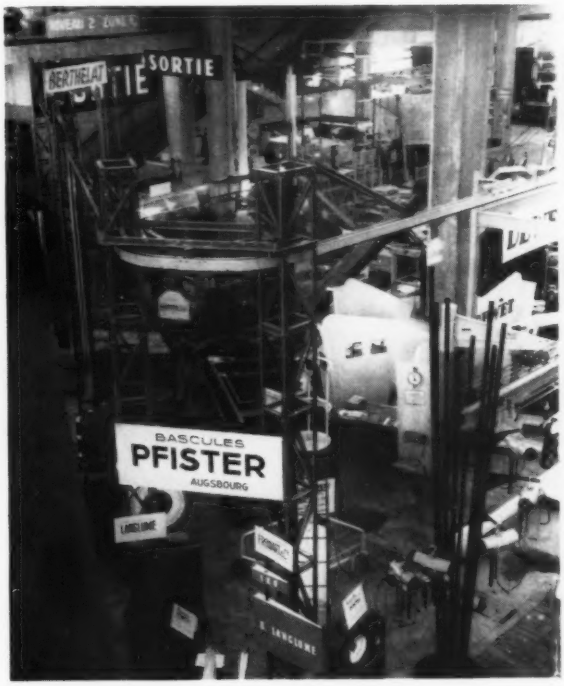

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Fig. 6. The stand of Cramptons, on which can be seen two Jones cranes, models K33 and K44. This company are also agents for Warsop Power Tools, Ltd., F. E. Weatherill, Ltd., and The Villiers Engineering Co.

7

Fig. 7. The Griffet diesel-electric mobile crane is available in two models. Type AE 7151, 7 tons capacity (illustrated), and type 812 S.C., 12 tons capacity, both have a road speed of 22 m.p.h.

Fig. 9. A Michigan model 75A, shown on the stand of Genemat.

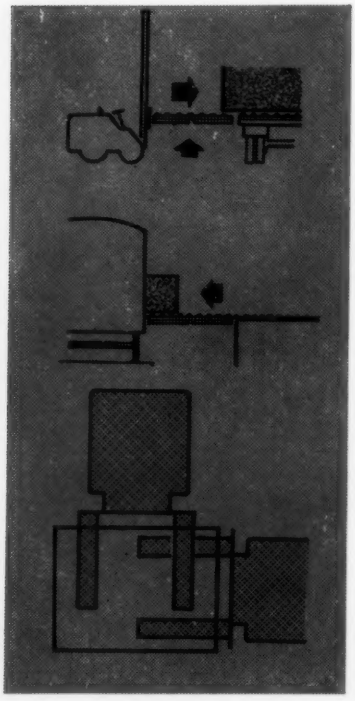

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Fig. 8. Diagram showing use of the Siren roller-loading pallet. Fig. 18.

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Fig. **10.** The *Elbolift* fork lift vehicle available in capacities from 12,000 to 20,000 lb, shown by Fenwick

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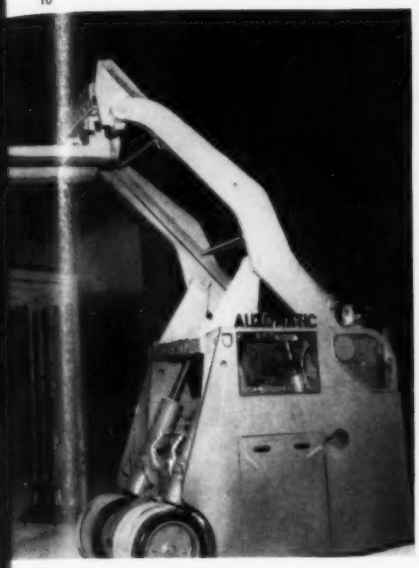

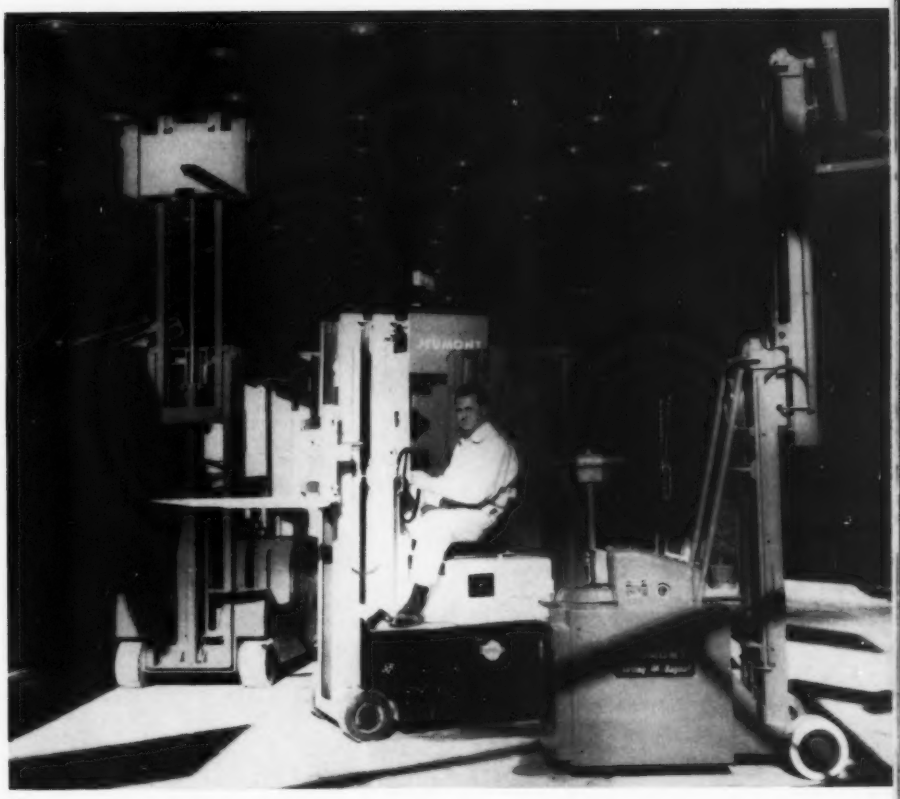

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Fig. **11.** Jeumont manufacture the Lansing Bagnall range of fork lift trucks. On show was a prototype new vehicle known as type FOER 1. (with driver), which has been designed in France and is based on Lansing Bagnall's model PFTC. It has a lifting capacity of 1 ton to a height of 10 ft 9 in and an extremely small turning radius of 4 ft 6 in. Models FOER 245 and FOER 3 were also shown.

Fig. **12.** Examples of conveyors including a circular type shown by Mécanisation Moderne, who are associated with Abisch Conveyor & Furnace Co., Ltd.

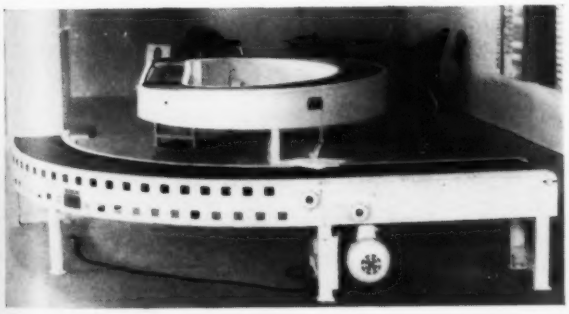

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Fig. **13.** The centre piece of the Tirfor S.A. stand was a large illustrated diagram explaining the working principle of the Tirfor universal lever-operated winch available in two sizes, the T13 Super, capacity 3,307 lb and the T35, capacity 3/5 tons.

13

Fig. **14.** The stand of Monorails Tourtellier, who make overhead rail equipment including electric overhead 'Telerail' system for a capacity of 11 to 660 lb, the 'Monelec' capacity 550 to 3,300 lb, and the 'Neorail' capacity up to 3,300 lb. This Company is an agent for James Scott & Co., Glasgow.

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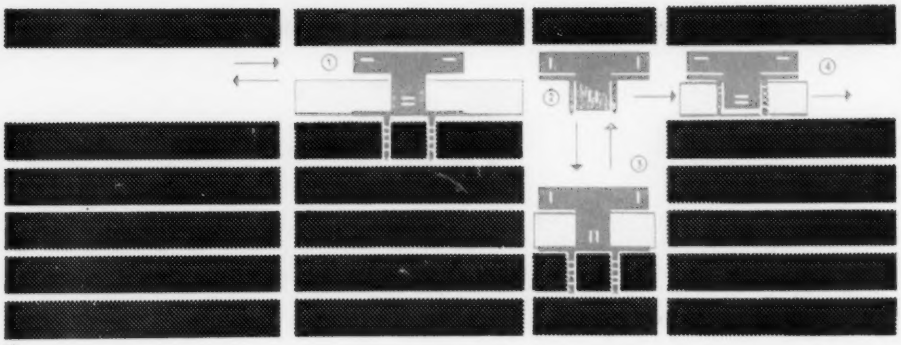

Fig. 15. Diagram showing operation of the Irion 'Universal' which is combined side and front-loader. This is achieved by swivelling the wheels through an angle of 90 deg to give whichever direction of movement is required.

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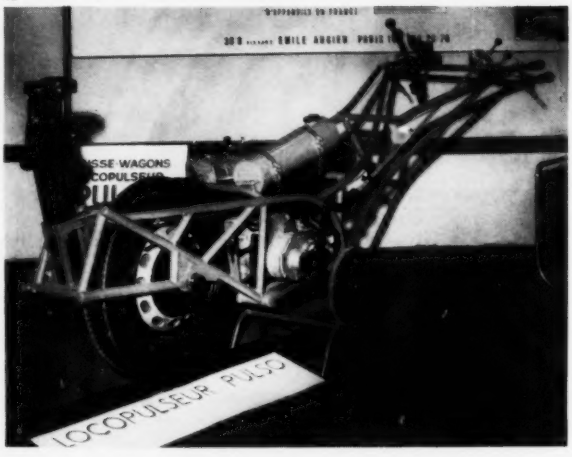

Fig. 16. Pedestrian-controlled wagon shunter shown by Gillet (Société Raymond).

18

Fig. 18. This light alloy special roller-loading pallet is made by Siren. It measures 78¾ in × 58 in, weighs 198 lb and enables loads up to 4 tons to be easily rolled off a fork truck or other vehicle for loading.

Fig. 17. A Coventry Climax fork truck exhibited on the stand of Société Technique D'Importation de Material D'Entreprice (S.T.I.M.E.). In the background can be seen a Rapsitan conveyor.

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Fig. 19. Examples from the range of trolley castors and other types of wheels and pulleys shown by Chaignaud.

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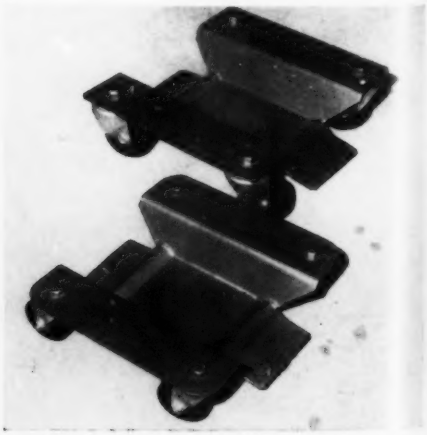

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Fig. 20. Many different forms of conveyors were featured by Gobert, who are agents for J. Collis & Sons, Ltd.

22

Fig. 22. Conveyors of many different sizes most of them of the vibratory type were shown by Sinex.

Fig. 23. A giant sphere, constructed entirely of Dexion angle, formed the centre piece in the Dexion Stand.

Fig. 24. A section of the comprehensive display of trucks and equipment to be seen on the stand of H. C. Slingsby.

Fig. 21. Typical example from the extensive range of transportable conveyors made by Thimon. This model is 40 ft long, travels at 200 ft/min, is powered by a 5 h.p. electric motor and has a capacity of 1,413 to 1,942 cu. ft/hr.

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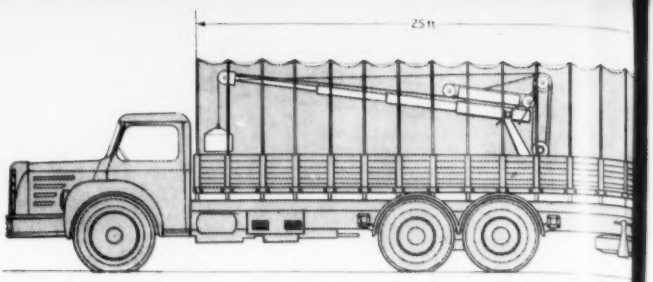

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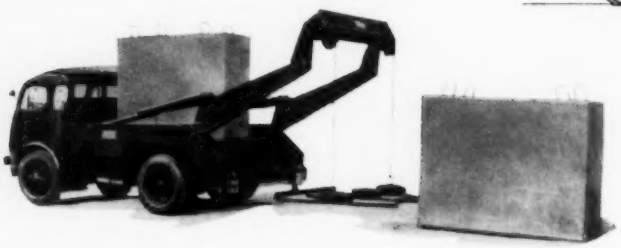
Fig. 25. Diagram of the Grue telescopic hydraulic lorry loading crane made by Société de Tolerie et de Mécanique. Fully extended to a length of 15 ft it will lift a load of 1,102 lb, or when retracted 3,307 lb. It can be rotated through 180 deg, elevated 45 deg above centre and declined 20 deg below.



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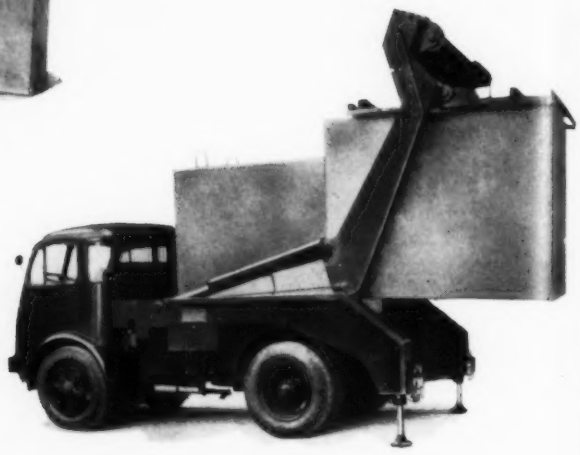

Fig. 26. Sequence of operation for the Bennes Samson Multi-caisson type-345 container handling unit.

Fig. 27. A Nuffield 'Universal Four' tractor shown by Manox., coupled to a Shawnee Poole dumper. This company also showed a Hyster TC200 fork lift truck and Caterpillar No. 1955 shovel.

27

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Fig. 28. Société Française D'Ory-Catalyse have introduced a catalytic form of filter for removing obnoxious fumes from diesel engines. It is fitted in the exhaust system and is claimed to remove 60-85 per cent of all toxious, irritants and odours in the exhaust. The 'throw away' element lasts for 2,000/2,500 hr.

29

Fig. 29. A comprehensive layout of Fisher & Ludlow 'Flowlink' overhead conveyor shown by Mabor. This company also exhibited the 'Nestier' nesting boxes for conveyors, and other purposes, which are available in a wide range.

Fig. 30. Steel-mesh belting is made by Gantois. One of the most recent additions to their range is this steel-edged mesh belting.

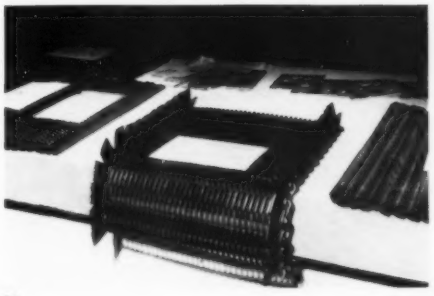

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Fig. 31. The Automanu counterbalanced loading ramp adjusts itself automatically when heights vary between loading ramp and vehicle.

Fig. 32. Pneumatic equipment on the stand of Martonair (S.à.r.l) representatives in France of Martonair, Limited.

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Fig. 33. A lightweight trailer-type belt conveyor with hand-operated hydraulic adjustment made by Garnier & Cie.

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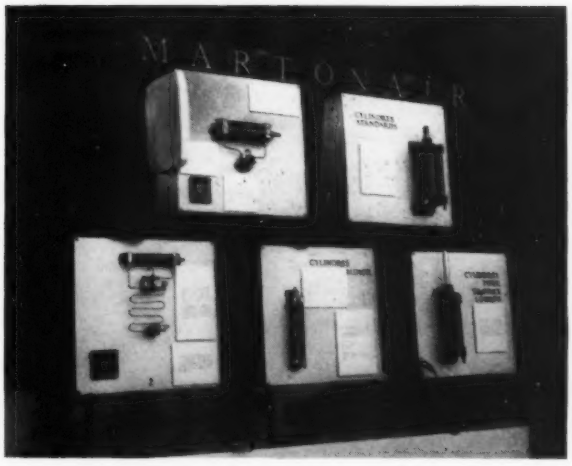


Products exhibited by British firms other than those illustrated in this review included:— Massey-Ferguson S.A. who had three tractors on show, including one fitted with a rear fork lift attachment, rated to raise 1 ton to a height of 9 ft 4 in. F. Perkins had examples from their well-known range of diesels, types 4/99, P3, P4 and P6.

Felco-France, a subsidiary of Felco Hoists, Ltd., exhibited a range of equipment made in France. In the forefront of the stand was a 5-ton, 3-motor overhead crane on a special mounting for exhibition purposes. It was shown with a Felco equalizing sling of 3 tons capacity. Other items included the Burtonwood tail lift, Templewood crane fork and Wedco metal fabric sling, all now being made under licence.

Burton Fils, who represent Ewart Chainbelt Co. and Fellows Brothers, Ltd., showed a Ewart enclosed chain conveyor; Armax-Batignolles represented R. H. Corbett & Co., Ltd.; Renold Brampton S.A., Renolds Chains, Ltd.; Forges de Vulcan, Conveyancer Fork Trucks, Ltd.; and Mecanique-Industrie-Chimie, W. C. Youngman, Ltd.;

BAGGAGE CONVEYORS IN S.S. *CANBERRA*

THE P. & O. turbo-electric 45,000-ton liner *Canberra* now under construction at Harland & Wolff's Belfast shipyard is one of the biggest passenger ships to be built there so far. Planned to go into service in 1961, on the run to Australia and from the Pacific to the west coast of America, this vessel has many innovations and is described as the 'Ship of the Century'.

Among a number of outstanding features is a system of conveyors for handling baggage which is being installed by J. Collis & Sons, Ltd., the contract for which was obtained in the face of considerable competition.

Requirements

1. To speed up on-loading (*a*) into the Baggage Room
   (*b*) up to the Cabin Decks.
2. To reduce off-loading time for baggage and reduce passengers' waiting time and to result in a quicker 'turn round' for the shipping company.

In addition to the time-saving factor, the ship owners wish to preserve the clean lines of the ship by avoiding the use of derricks and to have all equipment as an integral part of the ship and to operate automatically.

The problem of planning such an installation was no small matter, particularly when it is realized that the loss of one second per piece of baggage loaded would mean an increase of loading time of 75 minutes for a full pay-load. The human element has to be the controlling factor when determining the maximum output or input of a conveyor system for baggage where the feeding and final distribution must be made by hand. It was found that the minimum time for an experienced stevedore to handle one piece of baggage was four seconds, but the average time over an hour reached six seconds.

The varying elements of nature and berthing facilities had to be provided for in the design.

Provision is made for:

(*a*) Variation of 16 ft in tide level.
(*b*) The varying heights of quays above the mean tide level.
(*c*) The permanent list.
(*d*) Displacement of ship according to load.

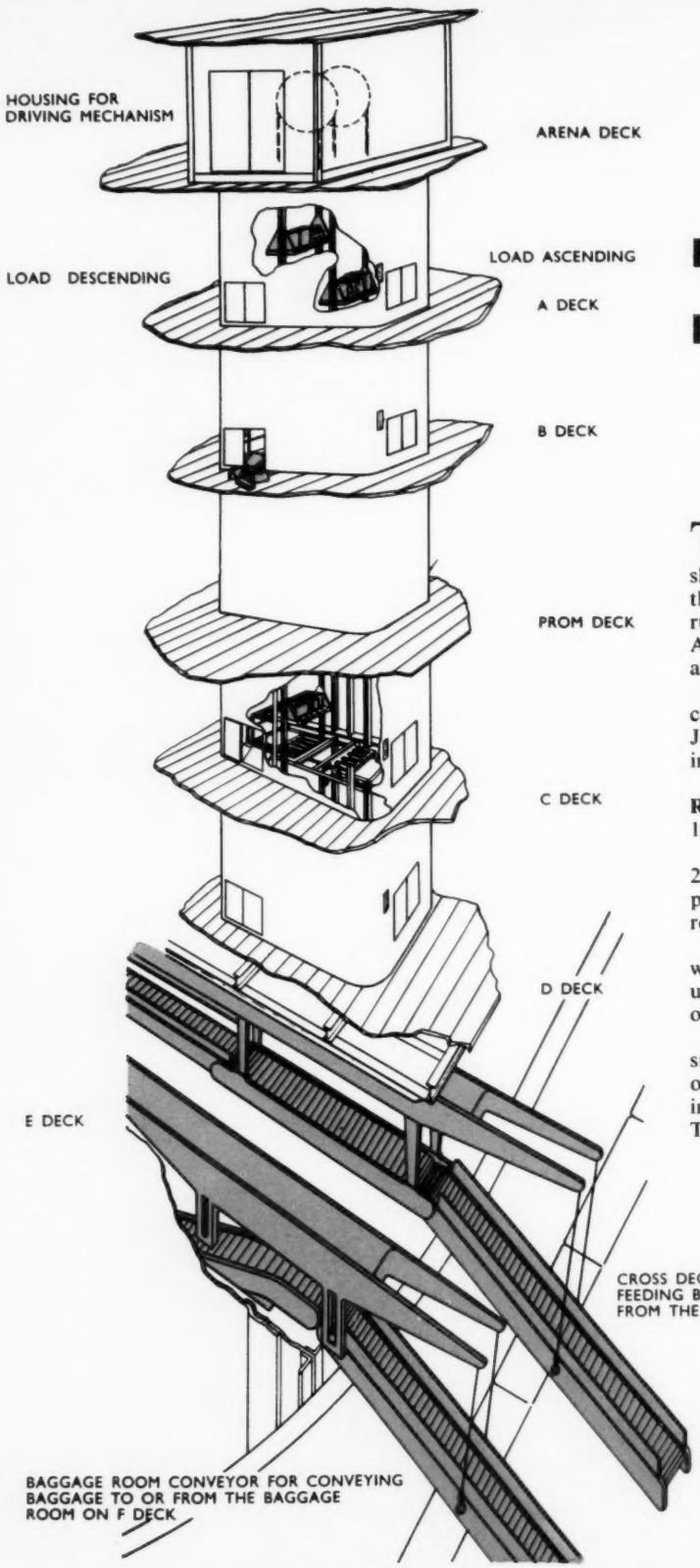
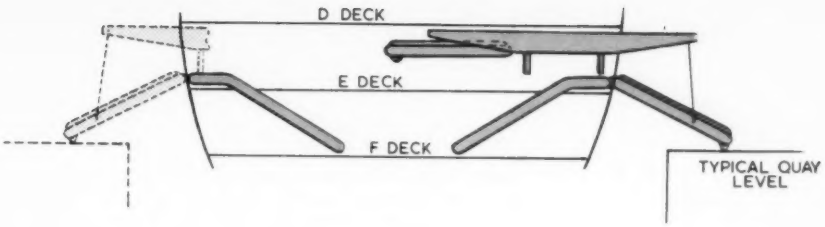

HOUSING FOR DRIVING MECHANISM
ARENA DECK
LOAD DESCENDING
LOAD ASCENDING
A DECK
B DECK
PROM DECK
C DECK
D DECK
E DECK
CROSS DECK CONVEYOR FOR FEEDING BAGGAGE TO OR FROM THE VERTIVEYOR
BAGGAGE ROOM CONVEYOR FOR CONVEYING BAGGAGE TO OR FROM THE BAGGAGE ROOM ON F DECK

Fig. 1. Cut-away view of the s.s. 'Canberra' showing: the VertiVeyor, pre-selective-type cross-deck and baggage room conveyors extended to one side

It was apparent that for simplicity and ease of operation two systems were required: one receiving 'unwanted' baggage and delivering it direct to the baggage room and the other receiving 'wanted' baggage for delivery to the required deck and cabin. A dual system was devised to load or off-load on port or starboard sides. This consisted of a baggage room conveyor and a cross-deck conveyor linking with an elevator.

Baggage Room Conveyors

This consists of a fixed installation of the *SlatVeyor* comprising two swan-necked slat conveyors, one each side of the ship.



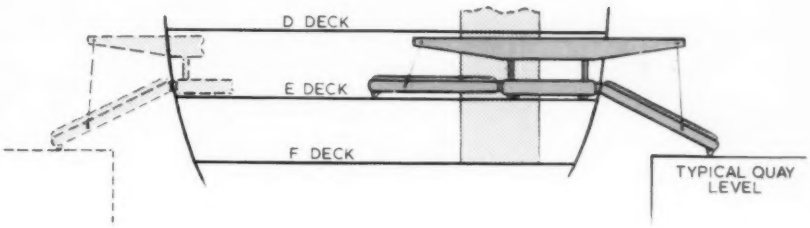


Fig. 2. The baggage room conveyors with one of the ship-to-shore sections lowered to the quay

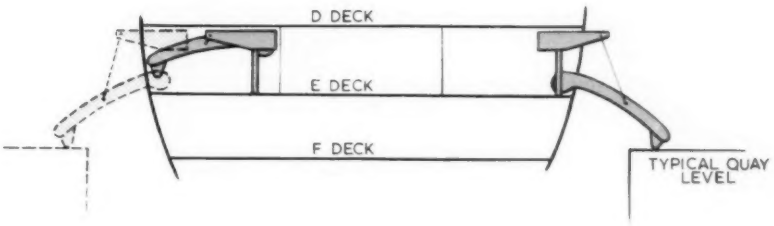
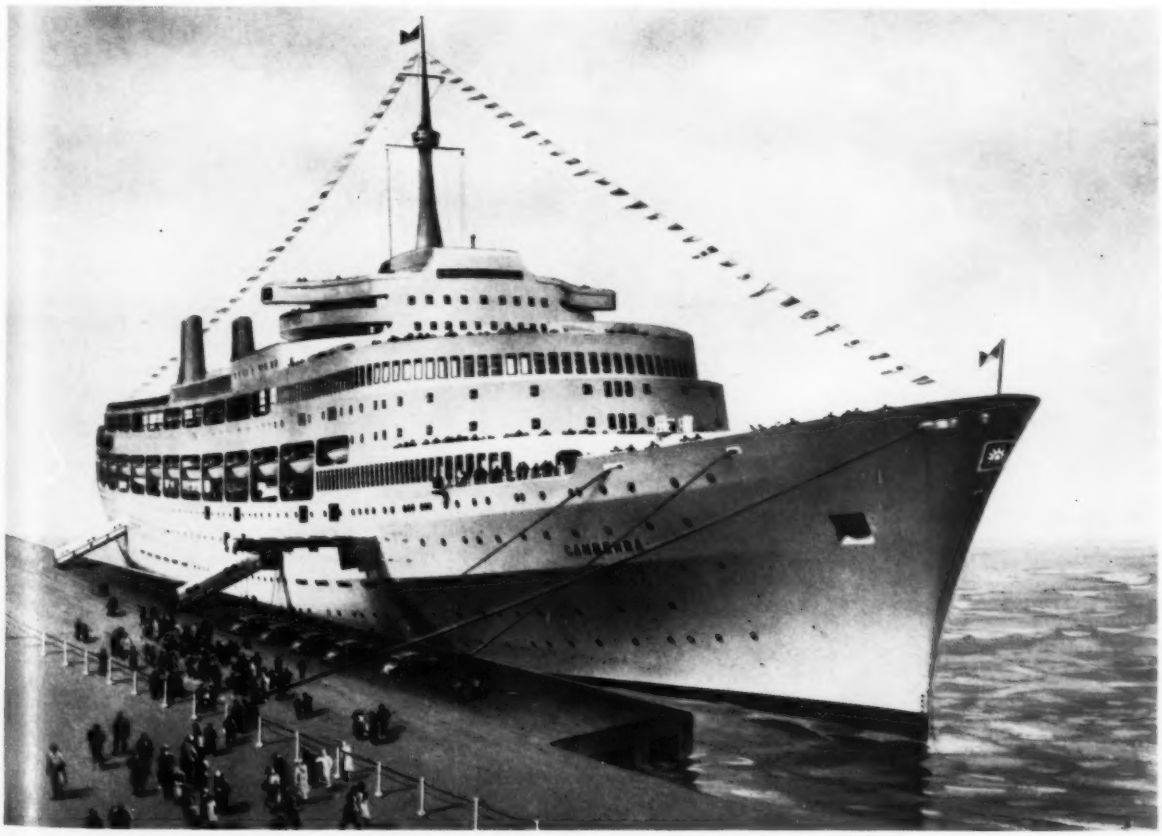


Fig. 3. The cross-deck conveyor showing the traversing gantry, and the location of the VertiVeyor

Fig. 4. A stores conveyor shown extended to the quay, and another retracted between decks

Fig. 5 (below). Artist's impression of the 45,000-ton P. & O. passenger liner 'Canberra'



Commencing at a height of 27 in from the deck on the inboard side of a shell door on E deck, each conveyor runs through the decking down into the baggage room on F deck. To connect the conveyors to the quay, two straight sections of the *SlatVeyor* are provided which may be extended from either side of the ship as required, and lowered into position on the quay from a travelling overhead gantry located on E deck. This gantry, with sections of the *SlatVeyor*, traverses the whole width of the ship as required for starboard or port on-loading or off-loading. Each unit has its own power supply and the electric motors are provided with automatic brakes to ensure the positive arresting of the load should the electricity supply fail.

The installation is designed to run at 60 ft per minute with a unit load capacity of 50 lb per running foot. The conveyors will operate in either direction and can be remotely controlled from the baggage room or at either end.

Deck Conveyors

This system is similar in operation to the baggage room installation. It consists of a horizontal section of the *SlatVeyor* with a ship-to-shore section at each end. The whole is held from a gantry which traverses the ship to serve either the port or starboard, as required. The *SlatVeyor* delivers adjacent to a pre-selective vertical elevator, the *VertiVeyor*, where the baggage is sorted into groups for the various decks.

The *VertiVeyor* serves five decks, each having a loading and discharge station and at each station a loading table is provided with a gauge to ensure that the maximum size of load is not exceeded. To enter the *VertiVeyor* loads have to pass through pneumatically operated sliding shutters which are fire and smoke proof.

Assuming that the *VertiVeyor* is being operated from the lowest deck, the loader will place the required amount of baggage on the loading table. Pressing the selector button for the required deck locks the remainder of the circuit and prevents further selection from that deck until the former selection has been put into effect. The next empty tray will automatically open the fireproof shutters and the load will move forward for the ascending tray. The deck selection device is automatically set, the loading platform retracts, and the fireproof shutters close, releasing the circuit for the next selection. The loaded tray travels the full height of the *VertiVeyor* and on descending and approaching the discharge station the pre-selector opens the fireproof shutters and the load is automatically transferred to the discharge platform; the shutters close again and the empty tray continues to pick up another load. The discharge platform is then automatically cleared by a pneumatically operated thruster which pushes the load at right angles to make room for the next load that arrives. The process of off-loading baggage from ship to shore is identical, but in reverse, loads being fed in at the receiving stations on the various decks to be discharged on E deck where they are transferred from the *VertiVeyor* to the *SlatVeyor* and the quayside.

Four conveyors are also provided on E deck for loading stores. Three of these have retractable gantries which extend and lower them from the ship to the quay. The fourth conveyor is similar but has no supporting gantry and is portable.

A report in more detail on this installation will appear in a later issue of MECHANICAL HANDLING.

FEDERATION EUROPEENE DE LA MANUTENTION

THIS Association, founded in 1953, brings together through the medium of National Committees the mechanical handling equipment manufacturers of 13 European countries. At the 7th Congress of the Federation held at Lucerne, Switzerland, in September, more than 250 industrialists attended from Austria, Belgium, Denmark, Germany, Great Britain, Finland, France, Holland, Italy, The Saar, Spain, Sweden and Switzerland, as well as from the affiliated association, *The International Ropeway Association*, participated in this Congress. Certain representatives of the mechanical handling industry of the U.S.A. were also present as observers.

Some appreciation of the valuable work that is being carried out by the specialized sections of the F.E.M., in which manufacturers of similar equipment are grouped, can be appreciated from the following reports which were issued after the Congress and cover briefly the work being undertaken.

Section 1—Heavy Lifting and Mechanical Handling Equipment: the drawing up of a terminology in six languages of the terms used in the industry; the establishment of a European Standard for the design and construction of both the structural and mechanical parts of cranes; the standardization of track widths, nominal loads and spans of building cranes; the determination of the qualifications and minimum experience necessary for the operation of building cranes and the setting up of general principles for the training of drivers for these cranes; the establishment, based on a study of the various safety regulations in force in the different countries of Europe, of a list of essential safety devices for building cranes; the determination of the basis for an exchange of export statistics.

The officers of this Section are: President, J. Pradon (France); Vice-Presidents, Mr. Klein (Germany); Mr. Lo Varco (Italy).

Section 2—Continuous Conveying Equipment: the study of a second edition of the terminology in six languages, the 1st edition having been published at the beginning of 1959; the classification of bulk materials to be conveyed using symbols illustrating the characteristics of each material; the study of a decimal classification; the standardization of components of belt conveyors and roller conveyors; the study of the safety regulations in force in the different countries.

The officers of the Section are: President, Mr. Stent (Great Britain); Vice-Presidents, Mr. Borthen (Sweden); Mr. Hamann (Austria).

Section 3—*Aerial Ropeways and Cableways:* the work of this Section is carried out in close collaboration with the *International Ropeway Association.* A terminology in six languages; a standard for the design and construction of aerial ropeways; the standardization of symbols used in design; participation in the work of O.I.T.A.F. (Organizatione Internationale Transporti a Fume). The officers of the Section are: President, Mr. Kaufmann (Germany); Vice-President, Mr. Zuberbuhler (Switzerland).

Section 4—*Industrial Trucks:* the stability regulations for fork lift trucks; the standardization of pneumatic and solid tyres; the standardization of nominal capacities for tractors; the standardization of driving units for motor trucks; the establishment of a Safety Code in two parts: first, constructional regulations and, second, rules for operation and maintenance.

Standardization of fork lift truck elevating carriages; the selection of representatives to attend the 3rd 'Port Handling' week of the I.C.H.C.A. at Antwerp; the terminology in six languages of the Section was published in 1958.

The officers of this Section are: President, Mr. Turrinelli (Italy); Vice-Presidents, Mr. Ramqvist (Sweden); Mr. Dreyer (Switzerland).

Section 5—*Mobile Cranes:* a European standard for mobile cranes, both for their design and construction and also as regards their performance.

The President of the Section is Mr. Hallsworth (Great Britain).

Section 6—*Pneumatic Handling Equipment:* the standardization of the guarantee clauses for pneumatic handling apparatus; the standardization of pipes and flanges; the terminology of the Section in six languages is in process of being printed.

The officers of the Section are: President, Mr. Mack (Germany); Vice-Presidents, Mr. Berchet (France); Mr. Baumgartner (Switzerland).

Section 7—*Lifts and Hoists:* a terminology in six languages; general conditions for the sale and erection of lifts and hoists; the standardization of operating and signalling devices; the standardization of loads and speeds; liaison with the European Commission for Safety Regulations.

The officers of the Section are: President, Mr. Herlin (Finland); Vice-Presidents, Mr. Walder (Switzerland); Mr. von Wiedstruck (Austria).

Section 8—*Earth-moving Equipment:* a terminology in six languages; safety regulations and test conditions for caterpillar-mounted mechanical shovels; a European standard for universal excavators.

The Chairman of the Section is Mr. Meyer (Germany).

Section 10—*Light Lifting Apparatus:* the adoption of a specification for electric pulley blocks; the adoption of a specification for rack and screw type jacks; the study of a specification for hand-operated pulleys; draft instructions for the operation of small lifting appliances; a terminology in six languages.

The officers of the Section are: President, Mr. Huber (Switzerland); Vice-Presidents Mr. Stein, (Germany); Mr. Verlinde (France); Mr. Clayton (Great Britain).

In addition to the work carried out by the individual Sections attention is drawn to that accomplished by the F.E.M. as a whole.

The Editing and Publication Committee has studied the question of the distribution of the terminologies and ways and means of extending this work. It has considered the possibility of setting up a general dictionary for mechanical handling, bringing together all the terms contained in the terminologies of the sections with an appropriate cross-index. The officers of this Committee are: President, Mr. Jacquot (France); Vice-Presidents, Mr. Salzer (Germany); Mr. Silk (Great Britain).

A committee under the chairmanship of Mr. d'Yerville (France) has studied a draft for the establishment of a joint foreign customs tariff of the European Economic Community and has drawn up proposals which, through the intermediary of COLIME (Liaison Committee of the European Mechanical and Electrical Industries), have been transmitted to the appropriate Committees in Brussels.

The F.E.M. has established a close liaison with the International Standards Organization (I.S.O.) with a view to collaborating in the work undertaken or to be undertaken by the I.S.O. and relating to mechanical handling equipment and its component parts.

An inquiry addressed to the different National Committees has made it possible to establish an index of the turnover figures relating to mechanical handling appliances in the whole of the countries affiliated to the F.E.M.

These are as follows:

1954	—	100
1955	—	117
1956	—	138
1957	—	157
1958	—	177

The Council of Management and the General Assembly of the F.E.M. under the chairmanship of Mr. Borthen (Sweden), President of the Federation, passed resolutions required for the administrative and financial management of the Federation and examined problems of general interest to the European mechanical handling industry.

A Committee was set up to study and prepare comments on 'The General Conditions for the Supply and Erection of Plant and Equipment' published in Geneva in March, 1957, by the European Economic Commission of the United Nations Organisation. These comments will show how these conditions should be interpreted in regard to the various types of equipment supplied by the members of the F.E.M.

The decision of the members of Section 8 of the F.E.M. (Earth-moving Equipment) to affiliate from now on with the European Construction Equipment Federation was approved but in view of the fact that certain items of the equipment in question, while being for Public Works, are nevertheless involved in mechanical handling, it was stressed that a close liaison between the two organizations was desirable.

The Steering Committee of the F.E.M. for the year 1960 will be composed as follows: President, Mr. P. B. Silk (Great Britain); Vice-Presidents, Mr. E. Turrinelli (Italy; Mr. Frey (Switzerland); Honorary Presidents, Mr. J. d'Yerville (France); Mr. G. Salzer (Germany); The Permanent Secretary is: Mr. J. de Boissard (France).

The 8th annual meeting of the F.E.M. has been arranged for the end of June 1960 and will take place in Stockholm, Sweden.

The Permanent Secretariat of the F.E.M. is in Paris, 10, Avenue Hoche.

HANDLING WITH INDUSTRIAL TRUCKS

PART 3—STRADDLE CARRIERS, SIDE LOADERS AND SIDE CARRIERS, TRUCK ATTACHMENTS AND FORK LIFT TRUCK ACCESSORIES

By L. J. Hoefkens, A.I.Prod.E.

THE straddle carrier, like the side loader, is designed primarily for the transportation of long lengths of materials. As its name implies it straddles the load and carries it between the four road wheels and under the chassis, Fig. 64. Therefore unlike the side loader it cannot stack or unstack materials; on the other hand it can handle heavier loads up to 20,000 lb and at a high speed. Special models can be constructed to individual requirements. It is particularly suitable for heavy timber, Fig. 65, concrete or steel pipes, Fig. 66, and girders. The height from the ground to the underneath of the chassis is of the order of 5 ft so that loads of this dimension can be handled provided they are not in width greater than the width of the hooks which support the load.

A load of oil drums on special pallets or a load of loose long material, loads of bricks or other awkward loads are positioned on dunnage and the truck drives over them. The driver then closes hydraulically the supporting hooks so as to pick up the load, after which it is raised hydraulically until it is gripped by the underneath of the chassis, Fig. 67. It is then in a very secure and safe position for transporting even over uneven ground. In other words in this type of truck we have a means of loading and unloading and transporting a considerable unit load with only one man. For speed in handling with economy of labour it is probably one of the most efficient materials handling devices yet produced. No doubt we shall see smaller ones developed for certain applications inside a factory. They are of course designed to meet the requirements of the Ministry of Transport for vehicles travelling on public highways.

As a matter of interest it can be mentioned that one application in the U.S.A. eliminates entirely any waiting time for the unloading of incoming vehicles. A certain product is delivered to a depot in palletized form on an open lorry. It slows down as it reaches the unloading yard where a tall straddle carrier overtakes it, straddles it and removes its load while both vehicles are on the move. This operation being completed, the lorry speeds up leaving the straddle carrier behind. The straddle carrier then deposits the palletized load and the lorry departs to make a further collection. Thus an ideal has been achieved of the elimination of vehicle turnround time. Obviously considerable skill is required on the part of the driver and very precise co-ordination and timing. The example does indicate, however, how far-reaching modern developments are, and handling feats are being performed which only a few years ago would have been considered a 'pipe-dream'.

Side Loaders and Side Carriers

The handling of materials in long lengths has always been a problem. Uncut timber and sawn planks, rolls of carpets and linoleum, lengths of steel bar and tubing, drainpipes and many other commodities have always occasioned much

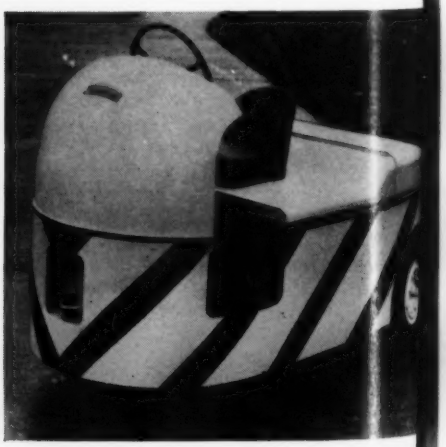


Fig. 63. (Left) a driverless electronically controlled tractor towing loaded trailers on a railway platform. (Below) a small battery-electric tractor capable of towing loads of 7-10 tons. Two types of vehicle referred to in Part 2 of this article

Fig. 64. A straddle carrier transporting a load of timber

manual handling and manipulation. Space is wasted where overhead tackle is used and even where mechanical aids are employed several handlings occur between operations or between stockyard and customer.

The advent of the side loading truck and the side carrying truck has changed these materials handling problems beyond all recognition. These trucks are made with small wheels where they are used internally or are equipped with pneumatic tyres for travelling in storage yards, quaysides or over the public highway.

The side loader in appearance resembles an aircraft carrier on wheels. It has a control cabin forward and on one corner of the deck. Immediately behind the driver's cab is a fork truck mast with forks which virtually divides the load-carrying deck into two halves. This entire assembly can be moved in and out, from one side of the deck to the other so that the forks can extend beyond the side of the truck and pick up a suitable load placed parallel to the length of the truck. The forks having raised the load, the mast assembly is retracted within the truck and the load is deposited on the deck, Fig. 68. When delivering a load the reverse procedure takes place. It is therefore possible for one man, the truck driver, to pick up a load of several tons, take it to its destination and deposit it, entirely single-handed. For example compare the delivery of a load of planks of wood from a timber mill to a furniture factory with the old method of manually unstacking and loading the road vehicle and on delivery manually unloading and restacking the timber plank by plank with several men. The saving of labour and time is of a very high order.

These trucks will operate in gangways little wider than the truck itself, Fig. 70. Allowance must of course be made for adequate space wherever in the layout it may be necessary for the truck to turn when loaded with material which frequently is longer than the truck itself. According to circumstances trucks are obtainable with diesel engines or electric motors driven by batteries carried on the truck.

Lifting heights and fork lengths can be made to suit the individual handling problem as with the conventional fork lift truck. Unit loads of timber need only be separated in the stack by timber spacers so that the forks can enter between the loads. Rolls of lino, pipes, rods or bars can be stored to a considerable height in racks. Some unit loads such as cases or drums can be stored and stacked on special long pallets which would be picked up centrally. It should be borne in mind that it would not be practicable to store palletized loads in depth as the truck cannot pass through a stack as a normal fork truck is able, neither can a stores aisle be stacked right up to a wall or fence as the truck can only pick up from its centre and therefore the distance from the forks to the front or rear of the truck would be lost in each aisle. These machines have been explicitly designed for long lengths of material and it is in this type of handling that they excel. It is stated by one user that one side loader working in an outside stockyard has replaced one overhead

Fig. 65. A straddle carrier transports a very long load

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Fig. 66. A straddle carrier transporting a load of long pipes

Fig. 67. A straddle carrier showing the load supporting hooks

Fig. 68. A side-loading fork lift truck transporting a load of timber on its long flat deck

Fig. 69. A 'wide deck' Sideloader handling a bulky load

crane, two mobile cranes, a tractor and a number of trailers, that a saving in storage has been achieved of 62·5 per cent together with an economy in labour of approximately 86 per cent. A typical example of the speed of operation is 5¼ min to withdraw a 2-ton load from a storage rack, take it 400 yd to its destination and to deposit it.

It was mentioned that a limitation of the side loader is the fact that it is not practicable to stack unit loads in depth; however this method of storage can be used with the 'side carrier'. The full description of this truck is 'the forward loader and side carrier'. It is designed to handle long lengths of material just as the side loader. It is in appearance very similar to a large conventional fork-lift truck, but the mast is so arranged that it can swivel to one side, thus enabling the load to be carried and transported end-on at the side of the truck and in the direction of its travel, Fig. 71. This means that it can pick up its load just as an ordinary fork lift truck and can pass through a stack to handle stacks placed in depth. As it withdraws with its load into the gangway it can by a combination of a steering and a slewing manœuvre swing the load from a position at right angles to the front of the truck to a transporting sideways position. This in turn means that although a long length has been picked up with a forward movement of the truck it can carry it through narrow aisles and doorways. For instance a 20-ft long unit load can be withdrawn into a 16-ft gangway and pass through a 9-ft exit. This truck is powered by a diesel engine, is equipped with pneumatic tyres for roadwork and can travel at a speed of up to 20 miles/hr. It has a lifting capacity of 12,000 lb at 24 in from the heel of the forks. The standard lifting height is 12 ft 6 in, but other heights can be made for special requirements, Fig. 72. Various alternative equipment can also be used with this truck, such as side-shift, ram, jib crane, rotating head, clamps or multiple prong forks.

The very latest use for a side loader is the handling of a very expensive and delicate load, namely a guided missile

Fig. 70. A side-loading fork lift truck stacking a load of timber in a saw mill using a narrow gangway in which to operate

Fig. 71. A side carrier fork lift truck emerging from a narrow gangway with the load of planks of timber slewed round and carried at the side of the truck in the direction of travel

Fig. 72. A side-carrier fork lift truck with the load of planks of timber moved into the forward position for loading a road vehicle

or rocket, a purpose for which it would seem admirably suited.

Truck Attachments

The fork lift truck is basically a truck designed to transport and to stack materials contained in or on pallets. It does this by means of two forks which can be raised or lowered on a carriage moving vertically between two slides. It was soon realized however that if the forks could be substituted by other load manipulating devices than its versatility could be substantially increased by permitting other types of loads to be handled which it was not practicable to palletize. Further it has been found that by the use of very ingenious load manipulators certain categories of goods could be handled and stacked without the necessity to employ pallets. Much capital investment and pallet maintenance costs can be saved in this way.

At the moment quite a few of these attachments have been developed and have been well tried out, some becoming the basic handling medium in certain industries. Further developments will undoubtedly take place as and when a demand arises from users. Some of these devices are a permanent fixture to the truck in which case the machine can hardly be called a fork lift truck any longer. The number so produced is increasing continually. The object of the designer is however to make them as attachments, if at all possible, so that they can readily be interchanged with the standard forks. The basic machine has now become an exceedingly versatile and highly efficient piece of industrial plant.

It must, however, be borne in mind that most attachments alter the load centre. Therefore the effect of the attachment is usually to down-rate the carrying capacity of the truck. This point should be checked with the truck makers before a decision is made as to the suitability of a particular truck for a job.

The usual attachments are as follows: (1) fork extensions; (2) ram; (3) jib; (4) load stabilizer; (5) side-shift; (6) scoop and shovel; (7) rotary head; (8) clamps, (*a*) case or bale, (*b*) case and carton, (*c*) paper roll, (*d*) drums; (9) drum forks; (10) brick-handling forks; (11) push-pull device.

(1) *Fork extensions* are loose sleeves which are designed to slide over the existing forks on a truck so as to enable loads to be picked up which would not be safe with the forks alone because their length is inadequate. Three points have to be borne in mind in using these sleeves:—

(*a*) they increase the thickness of the forks and consequently greater precision is needed when inserting them between stacked pallets. If the lower one is slightly over full components can be damaged.

(*b*) longer loads mean in turn a moving forward of the load centre and, before permitting this, reference should be made to the load chart applicable to the truck, to ensure that the load it is proposed to carry with extension sleeves is safe within the capacity of the truck.

(*c*) as the sleeves are a loose detachable item they are liable to be left around by the driver and will not be, at times, where they are required and consequently there will be a tendency to try to work without them with possible resulting damage to pallets or a tipping forward of the load.

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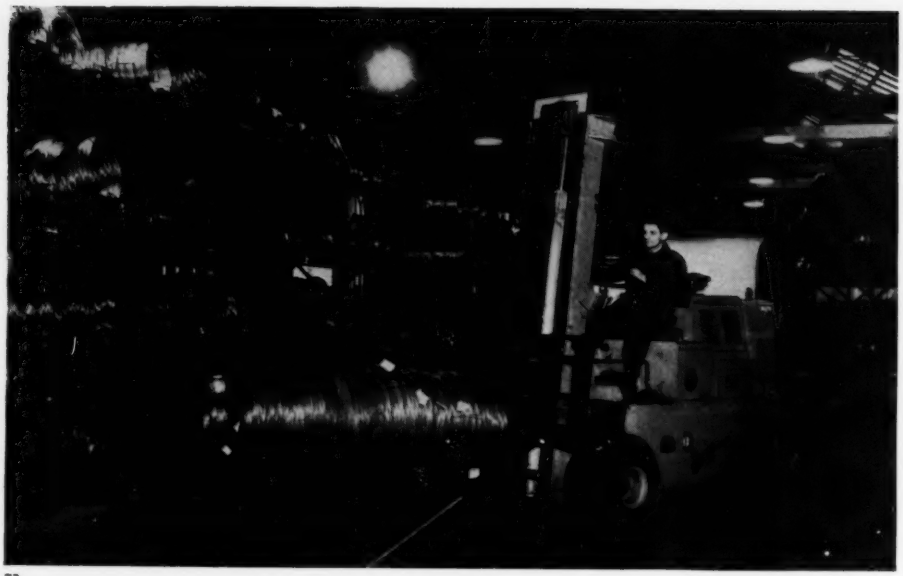

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Fig. 73. Rider-controlled truck fitted with a ram transporting a load of coils of wire

Fig. 74. Rider-controlled truck fitted with an adjustable jib attachment handling a 30-cwt oil conservator shell

Fig. 75. Rider-controlled electric truck fitted with a load stabilizer manipulating delicate slabs of material

There is an alternative which does not affect the first two points but does overcome the third difficulty. Sleeves, as before, are placed over the existing forks, but underneath each sleeve is a short peg. This peg fits into several holes drilled into the forks. The sleeve can be slid back so that no extension exists, then when a longer load is encountered, the driver lifts up the tip of the fork slightly, thereby raising the peg out of its hole and pulls the sleeve forward until the peg drops into one of the other holes. The holes are drilled to give the precise extension needed to match the various lengths of loads to be encountered. In this way the extension should always be correct and the sleeves are always there when needed as they never leave the truck.

(2) *Ram.* This device is a simple one, yet it is very effective for the type of materials it is designed to handle. It takes the form of a steel rod fixed to the fork carriage and projecting forwards. Depending on the objects to be handled there may be more than one rod, but usually a central one only is used. The rods can be of varying length and diameter again depending on the size and weight to be transported. They are used for handling such items as coils of wire, Fig. 73, motor tyres, large circular castings and coils of steel in rolling mills where the load can be as much as 15/20,000 lb.

(3) *Jib.* The jib attachment converts the fork lift truck into a small and very manœuvrable mobile crane, Fig. 74. The attachment, which is rapidly interchangeable with the forks, takes the form of a projecting girder fitted with a swivelling crane hook. In many cases the hook can be suspended from several positions along the boom thus giving a variation of load centre and consequently a range of lifting capacities. When considering the use of a jib attachment two points should be remembered. Firstly allowance must be made, when calculating the lifting height, for slings and chains. Secondly, as the fork lift truck becomes a mobile crane it falls under that section of the Factory Act governing cranes and a certificate of worthiness must be obtained from a competent person at regular intervals. The certificate applies to one truck only and the jib may not be used on a non-certified truck.

(4) *Load stabilizer.* Certain types of loads made up of many individual items such as cartons, crates, sheets of

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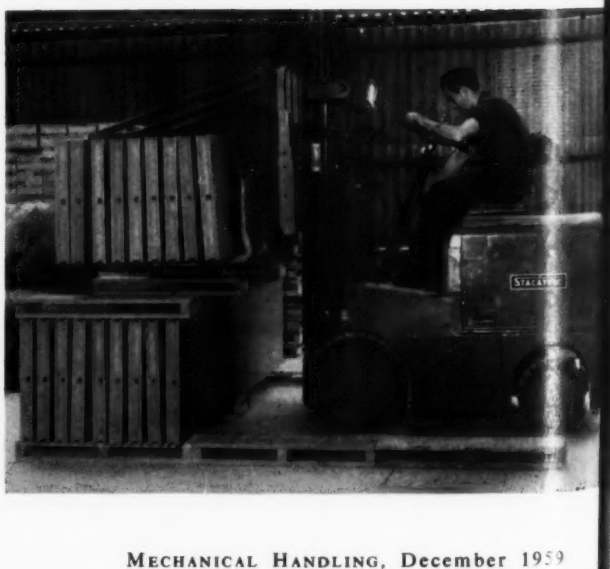


Fig. 76. Rider-controlled truck fitted with a special load stabilizer for gripping and holding pit props

Fig. 78. A driver-controlled truck fitted with clamps stacking bales of wool in a warehouse

Fig. 77. Rider-controlled electric truck fitted with coal-handling shove

metal are unstable during transport particularly over outside roadways. Vibration could cause the load to slip off the forks causing damage to material and possible injury to personnel. To overcome this problem various types of so-called load stabilizers are available, Fig. 75.

For example, one takes the form of a large rubber faced pad the size of the load and which can be brought down on to the load with a slight hydraulic pressure. To hold a load of sheet steel a similar overhead clamp is used but a greater hydraulic pressure is used in order to prevent the sheets sliding on one another. There are other forms of stabilizers specially designed to suit a particular commodity, Fig. 76. In each case the clamping action is operated and controlled by the seated driver.

(5) *Side-shift.* The side-shift mechanism is not a true attachment as it is built into the truck. It consists of an hydraulic control valve and a double-acting cylinder by means of which the fork carriage and loads can be moved horizontally a few inches either side of the centre. This means that it is not necessary for a driver precisely to line up his truck when stacking or unstacking pallets. It is particularly useful where drivers are not yet fully skilled in handling a truck as it saves time and wear of the truck during stacking operations. It also makes it possible to stack pallets in otherwise inaccessible places such as right up to a wall at the end of a row of stacked pallets.

(6) *Scoops and Shovels.* The capacity of a scoop or shovel which can be fitted to any particular machine depends on the amount of traction power available from the drive wheels of the truck, Fig. 77. If used in conjunction with the smaller capacity trucks only free-flowing materials can be dealt with successfully. Most scoops and shovels are operated by an hydraulic ram controlled from the driver's seat. Obviously there are limitations when attempting to use a fork lift truck for shovelling purposes.

(7) *Rotary Head.* By means of this attachment the fork carriage of a conventional fork lift truck can be made to rotate through 360 deg in either direction. It is achieved by an hydraulic motor operating through a wormwheel drive. The driver can therefore pick up a container of solid material and raise it up and empty it, returning it then to its normal travelling position. Liquids and free-flowing materials can be gently poured out of a container as the hydraulic control gives an inching movement if necessary. The containers must of course be fitted with suitable slides underneath in which to insert the forks and to retain the container safely in an inverted position.

This attachment has many applications in industry, the most common use being for handling swarf and scrap metals. Another one seen is the filling of hoppers of screw threading machines with screw blanks. A lightweight truck can proceed down a gangway between two rows of machines and can fill hoppers from the container it is carrying, at will, left or right.

(8) *Clamps.* Clamping attachments are constructed for a wide variety of products and consequently are made in many different forms and in a range of weight-carrying capacities. Basically they consist of two arms which can be moved outwards and inwards by hydraulic cylinders. Many different attachments can be fitted to these two arms according to the load to be handled. The clamp attachment can be made easily detachable from the truck in which case self-sealing hydraulic hose couplings are used so that fluid is not lost during the changeover operation. A special control is fitted so that the truck driver can operate either

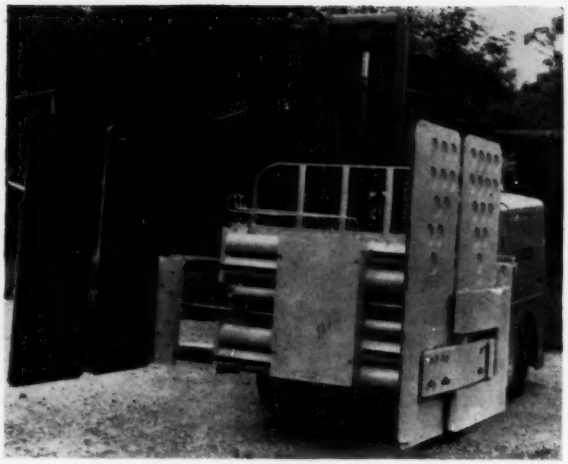


Fig. 79. An electric driver-controlled truck fitted with articulated carton or case clamps

clamp arm independently. In the neutral position both arms will open outwards or close inwards simultaneously. In practice this capability saves time as the truck does not have to be in perfect alignment with the load whilst at the same time it eliminates the strain which would otherwise be imposed on the clamp arms and the mast if either contacted the load before the other, in which case it would try to push the load horizontally.

(*a*) Case or Bale Clamps. This attachment consists merely of two arms about 1 ft high, the length and height from the ground depending on the types of loads to be dealt with, Fig. 78. They can be provided with a variety of load-gripping surfaces, the commonest being a plain surface for soft bales of, say, cotton, rag waste or wool; small steel spikes for packing cases and rubber or other facing materials for other kinds of loads.

(*b*) Case or Carton Clamps. The clamp arms are each fitted with a narrow member which is centrally pivoted at the end of each arm. These members in turn are fitted with two large area flat plates and connected to them by resilient mountings. The large area plates can be of various dimensions as also the clamp arms to suit different types of loads. They are covered with a rubber replaceable facing so as to grip such items as cartons securely. The purpose of the articulated clamp members is to compensate for variations in wooden cases or stacks of cartons, Fig. 79. If both cases and cartons are to be handled alternatively a pressure relief valve can be fitted within easy reach of the driver, so that by means of a small handle the maximum pressure exerted by the clamp arms on the load can be adjusted quickly, Figs. 80, 81.

(*c*) Paper Roll Clamp. The paper roll clamp consists of a fixed curved clamping arm and a movable clamping arm fitted with a curved pivoted shoe. The entire clamp can be fitted to a standard rotary head attachment so that not only can the truck pick up and stack a roll of paper but it can do this at any angle. For instance it can pick up a roll lying horizontally on the floor, rotate it through 90 deg and stack it vertically as high as the building or truck will permit. It can subsequently remove it from the stack, rotate it and present it horizontally to a machine, Fig. 82.

Again it should be mentioned that it is necessary to check the down-rated carrying capacity of a truck fitted with both rotary head and roll clamps. The load centre will have been moved considerably forward and therefore as explained elsewhere, a lighter load must be carried in order to maintain the truck in balance.

(*d*) Drum Clamps. Drum clamps are stout steel arms with centrally pivoted members fitted with curved shoes to fit the outside diameter of the drum to be handled. Replaceable rubber grippers secure the load, Fig. 83. A pair of two-drum arms will hold one or two drums side by side and a pair of four-drum arms will carry one, two or four drums as required.

(9) *Drum Forks.* The normal wedge-shaped forks are replaced by round rods mounted on a carriage and interchangeable with the forks. There are two outer rods and one central one, so that two drums or barrels can be picked up at one time or three if placed in pyramid fashion, Fig. 84.

Fig. 80. A driver-controlled truck handling cases of detergents with articulated clamps

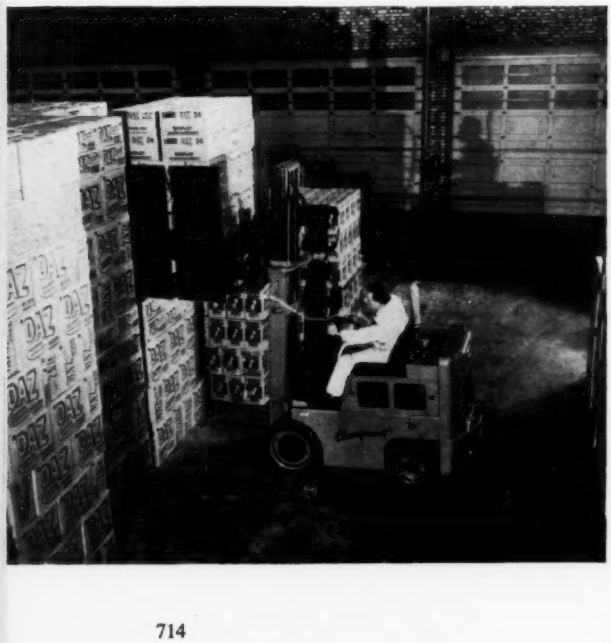


Fig. 81. A driver-controlled truck handling crates of glass bottles with articulated clamps

This method is used where it is the practice to stack the drums in a pyramid pattern, usually outside. Stacks can be broken down and built up by using drum forks although it is not always possible to pick out of the stack the maximum load of three because of the very nature of the pyramid pattern. Likewise one might think that by increasing the number of rods to four it would make the operation more efficient because a greater load could be handled at one time. This could be misleading because in a reasonable size stack of drums the occasions when one could pick out the full load of six drums are in the minority. The usual available load would be a lesser quantity. A sketch will rapidly show this point.

(10) *Brick-handling Forks.* The handling of bricks has always been an arduous task manually performed causing a considerable loss through damage and breakage. The invention of the 'Bickerstaff Fork' has gone a long way to eliminate this handling and consequently the damage.

Stacks of bricks are built up in a definite pattern leaving a number of gaps in the bottom row. Into these gaps are inserted the multiple tines of the Bickerstaff brick-handling attachment. On either side of each tine are movable grippers which are hydraulically expanded by means of torsion bars inside the tines, Fig. 85. In this way large quantities of bricks, up to 10,000 lb at a time, can be placed in the kiln, taken out again, stored and loaded on to road vehicles by one truck without handling individually a single brick, Fig. 86. If 'side-shift' is incorporated with the brick fork attachment the operation can be even further simplified.

(11) *Push-Pull Device.* In searching for ways and means to dispense with the expense of pallets a method has been found which is very suitable for cartoned goods. A special paper or fibre board load divider is used which has the front edge turned up at an angle of about 45 deg. The push-pull attachment consists of a flat steel plate replacing the forks and an extendable pusher frame with a gripping device along its lower front edge. When the frame is extended the gripper can be made to clamp the upturned edge of the load-dividing board which it then pulls gently together with its load on to the steel carrying plate. When it is required to stack or unstack such a load it is placed on top of other unit loads or removed by pushing it off the steel plate or pulling it on to the plate using the gripping device and the retractable frame.

Fork Lift Truck Accessories

Overhead Guard. An overhead guard takes the form of a strong canopy usually constructed of steel tubing extending from the front of the truck, clearing the head of the driver and fixed to the rear end of the truck. The two main supports are joined by a number of cross members so as to give the maximum protection whilst not impairing the driver's visibility, Fig. 87. In some cases the canopy is used as a means to support waterproof material to afford the driver some protection against the weather when working out-of-doors. However, this can only be done at the sacrifice of some degree of visibility and under certain conditions might not be considered to be a safe practice. Better is to provide the driver himself with personal protective clothing. The purpose of the guard is to protect the driver in circumstances where high stacking operations take place or where overhead obstructions might be encountered which could knock part of the load on to the driver.

Backrest Guard. A backrest guard is a frame of optional dimensions fitted to the top of the fork carriage and is to prevent parts of loose loads or small items from falling or sliding backwards onto the hydraulic lifting cylinder or hoisting chain, Fig. 88. When the forks are raised to their maximum height it should prevent any part of the load from falling or being inadvertently pushed on to the driver.

Fig. 82. A driver-controlled truck fitted with a roll clamp on a rotary head manipulating a roll of printing paper

Two-way radio. Where trucks are operating over a large area they can be fitted with a robust and compact two-way radio receiver and transmitter. A central control point is set up in any convenient part of the factory which is equipped with a master transmitter and receiver. Requests for the services of a truck are received by the transport controller by telephone and they are recorded on a work-sheet giving details of the load to be moved, the time of the request, by whom the request was made and the destination of the load. A truck, immediately on completion of a job, requests by radio from the controller the next job. He is given details by the controller and the time of the instruction is recorded against the appropriate item on the work-sheet. A study of the amount of empty running existing at the moment will soon prove whether such an installation can be justified because no doubt a high percentage will be eliminated by this method of rapid communication from a central control to the trucks.

A Post Office licence is needed before installation and a wavelength will be allocated by the Postmaster-General. Also call signs will have to be agreed for the controller to use when calling up the truck required. All drivers hear a call being made but one alone answers, namely, the one whose call sign is broadcast. Such an installation is inexpensive in relation to the increased efficiency which can usually be obtained. Equipment supplied by reputable radio manufacturers is highly reliable and quite capable of standing up to the vibration of an industrial truck. Such installation can, of course, be fitted to any type of industrial truck and is not exclusive to fork lift trucks.

Industrial Trucks and Productivity

The need to handle materials is as old as mankind. The earliest material handling device is man's hands guided and

Fig. 83. A driver-controlled truck fitted with drum clamps transporting four chemical drums

Fig. 84. A rider-controlled truck fitted with drum-carrying forks stacking two 40-gal drums

directed by the human brain, a combination which has still to be improved upon, although under certain conditions man's ingenuity is approaching it with automatic machines controlled by mechanical 'memories'. Whatever the future may bring in this direction can only be envisaged by imaginative thinking, but rapid developments are bringing the day nearer of the automatic factory, with robot transport and 'push-button' stores.

Looking back through history one finds that there have been two main incentives which have stimulated and urged mankind to rid itself of the arduous tasks of materials handling and gradually to devote its energies to more skilled work, either of the hand or the brain, work which is more rewarding both monetarily and mentally. The two urges are, firstly the instinct of self-preservation during time of war, and secondly the human desire to retain or improve its standard of living; a conflict of another kind, survival in an economic war.

Most of my readers will recall that during World War II a tremendous effort was made to reduce the effort of handling materials by the introduction of many mechanical devices such as the fork lift truck, Fig. 89, and the bulldozer, not only because of the urgent need for greater quantities of goods and materials to be moved or transported in a short time but also because of the nation's depleted manpower. Since the war, economic pressure, the fight against rising world costs and the imperative need to export our products to the maximum made labour-saving devices essential.

While production processes, machine tools, jigs and fixtures were already highly efficient and subject to constant scrutiny and improvement by designers and engineers, a breakdown into the constituents of the cost of an article brought the realization that there still remained an important field to be tackled, namely the overhead costs and in particular the so-called 'non-productive labour'. Further investigation showed that a high proportion of this class of labour was engaged in handling materials and that nationally it amounted to astronomical figures. Many far-sighted persons from Cabinet Ministers downwards have initiated propaganda which has aroused equipment manufacturers and users to improve their handling methods, so much so that in the space of 10 years the material handling equipment industry has become an important and flourishing part of our national economy. The latest techniques and methods are gradually spreading into diverse industries and methods of transport are being revolutionized. An Institute of Materials Handling has been established and the subject is being taught professionally at technical colleges.

Looking around the world, it can hardly be a coincidence that one finds that where the techniques of modern materials handling methods have been widely applied, that there also is the greatest prosperity and the highest standard of living. This appears to be also true when comparing one industry with another. It cannot be emphasized too strongly or repeated often enough, the very simple but fundamental statement: that every time material is handled it adds to its cost. The handling, of itself, does nothing to enhance its value or make it more attractive to the customer.

One of the most important types of equipment in the sphere of materials handling is the industrial truck; as a matter of fact, in some factories and particularly in warehouses it is almost the sole means of moving materials. Consequently with the emphasis on improvement in materials handling as a means of cost reduction, the industrial truck has seen many important changes and developments. Apart from the handling capabilities of industrial trucks, they constitute a further cost reduction potential because of their low cost of operation and great flexibility. This will have been appreciated from the descriptions given of the variety of trucks available to industry and also the various

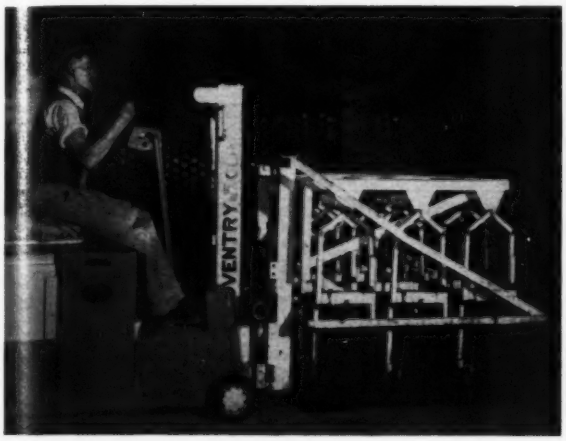
Fig. 85. 'Bickerstaff' brick forks about to enter a stack of bricks. Note special gripping device and method of stacking bricks

Fig. 86. A driver-controlled truck fitted with a brick-gripping device

Fig. 87. A rider-controlled reach truck fitted with an overhead canopy-type guard

Fig. 88. A rider-controlled fork lift truck provided with a backrest guard above the fork carriage

Fig. 89. A rider-controlled fork truck stacking palletized reels of cardboard nine deep to a height of 23 ft 6 in



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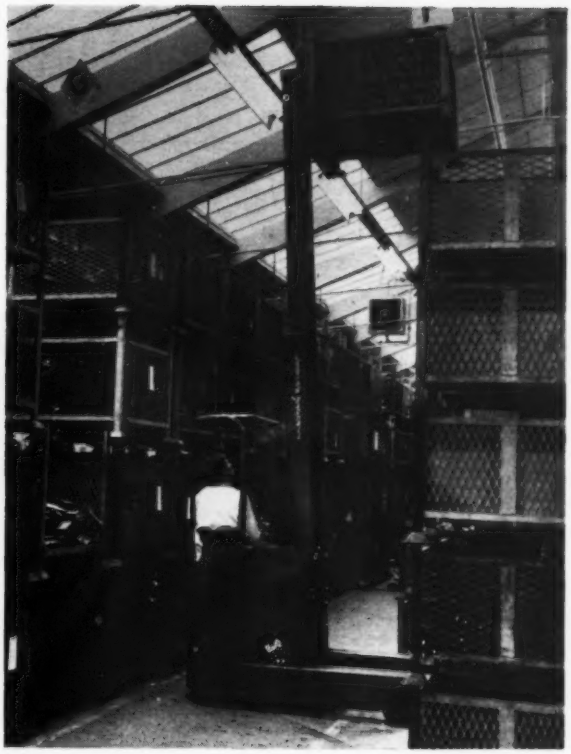

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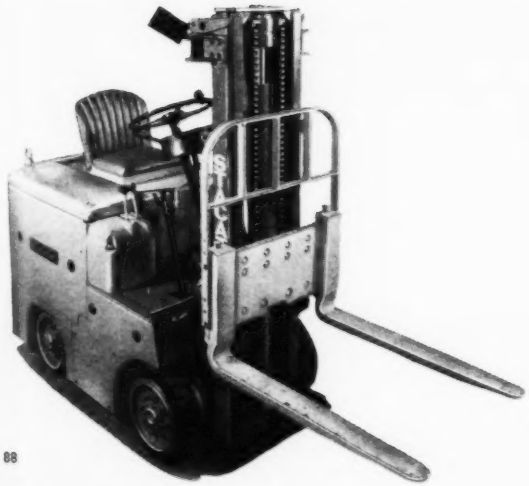

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duties which can be tackled by the same basic truck with special attachments.

How actually do trucks save money? If handling increases the cost, then bulk or unit load handling must reduce the cost. Compare for instance the company who some years ago received into its factory wagon loads of small castings piled up loose on the floor of the vehicle. Each piece had to be manhandled off the vehicle into some receptacle for transporting to the store. To-day the same loads or perhaps larger loads are received in box pallets which can be unloaded by a fork lift truck in a matter of minutes and taken direct to a storage area where they can be stacked up to roof height. Much labour has been saved, valuable floor space

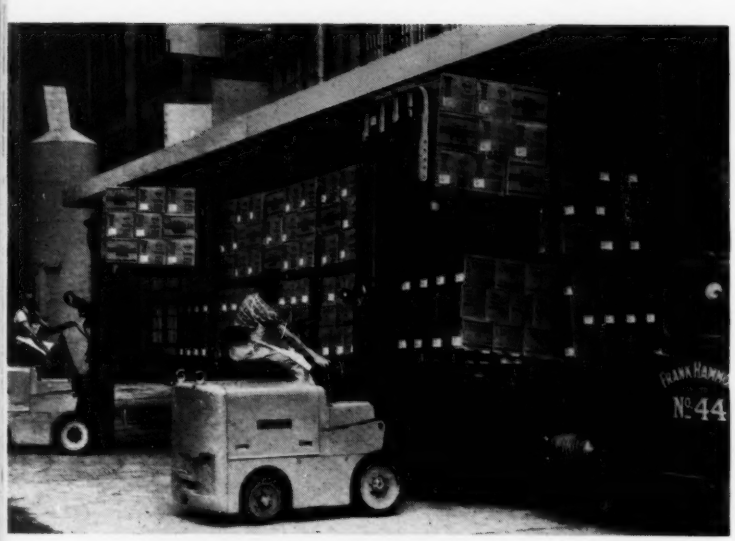


Fig. 90. A rider-controlled fork lift truck loading palletized materials on to an outgoing vehicle

in the store has been saved, and the supplier has benefited by a quicker turnround of his vehicle.

Similar comparisons can be drawn of handling operations right through every stage of manufacture until the final article emerges in pallets to be loaded mechanically by industrial trucks on outgoing vehicles, Fig. 90. Again a quicker turnround time is achieved also at the customers' works or warehouses where once more manual handling is entirely eliminated.

With less handling, the possibility of damage to goods is almost a thing of the past, likewise injury or physical strain of personnel is reduced to negligible proportions. All of these factors contribute towards cost reduction and a higher productivity.

Industrial truck handling increases plant efficiency as it makes for improved general factory housekeeping. Stores are neat stacked rows of pallets with clear traffic aisles. The number of persons who are able to move materials and therefore able to contribute to untidiness has been considerably reduced. Responsibility rests on the shoulders of a few truck drivers only, who would be unable to operate in untidy areas and congested gangways and are therefore most likely to maintain order.

Industrial trucks are flexible and are able to work in close integration with other pieces of materials handling equipment such as cranes and conveyors. However, whilst such items as cranes and conveyors are fixed and incur considerable expense when a factory layout is changed, industrial trucks can work almost anywhere and are unaffected by changes in the siting of plant or departments.

Industrial trucks also provide better working conditions for personnel and therefore reduce labour turnover and attract a better type of worker, one who appreciates a more skilful job than the manhandling of materials.

RAMP FOR TRANSFERRING FREIGHT CONTAINERS

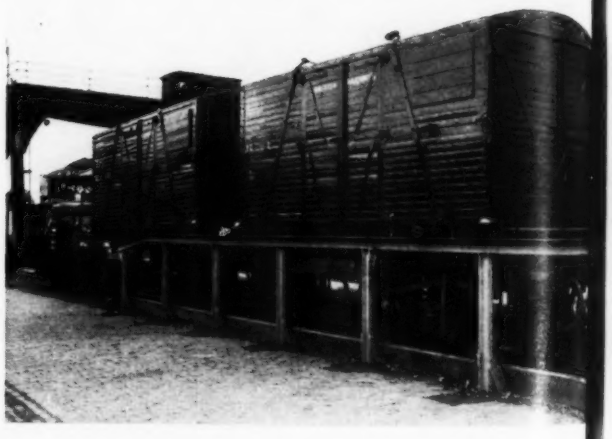
By John Grindrod, B.A.(Com.).

An experimental method of handling containers is the 'Penman' ramp. A wagon tractor or shunting engine pushes the containers on to the ramp and a lorry takes them off.

CONSIDERED to be the perfect unit load for road-rail carriage from door to door, the container is being increasingly used on British Railways in a growing variety of types. Whereas, in 1938, there were 15,000 of them in use, there are now 44,000 and thousands more are coming off the production lines.

Together with this phenomenal growth, continual research and experiments are being made to find new methods of effecting the speedy and safe transfer of the containers between rail and road. A new system of transfer being tried out, and with a good deal of success, is the Penman ramp.

The idea is simple and eliminates the need for any mechanical handling equipment such as cranes or fork trucks. It is also quick. Flat railrood cars with containers on them are shunted either by wagon tractor or shunting engine, between two raised rails, which in appearance are rather like handrails with an inclined section at either end. The containers are fitted at each corner with pull-out metal rollers. As the shunt moves between the rails these rollers start to bear upon the rails and the container is raised clear of the rail car. The latter is then drawn away and a road vehicle is backed under the supported container.



A hinged flap under the container engages with a batten on the floor of the road vehicle so that, as the latter moves forward, the container is carried with it. The incline at the end of the rails enables the container to settle down gently on to the deck of the road vehicle. The complete operation takes less than five minutes, but it is dependent on the containers being fitted with the special roller equipment

MIDDLE EAST PHOSPHATES SHIPPING TERMINAL

By a Special Contributor

Fig. 1. The terminal seen from the waters of the gulf

THE new phosphate shipping plant now in operation at Aqaba in the Kingdom of Jordan represents a major development in that country's economy. Phosphate and potash ore are the country's principal natural resources, but until now the exploitation of these assets—Jordan's sole industrial commodities of any significance—has been restricted by the lack of suitable shipping facilities. In 1955 Jordan exported only 160,000 tons of phosphate. The new shipping plant, designed and constructed by Simon Handling Engineers of Cheadle Heath, Stockport, will allow exports to be stepped up immediately to about 250,000 tons per year, and the eventual export target envisaged at present, 1,600,000 tons of phosphate and potash per year, is well within the capacity of the plant.

The Setting

A short strip of coast on the Gulf of Aqaba is Jordan's only outlet to the oceans of the world, and as a result of political changes in the Middle East its importance has increased enormously. The southerly route from Amman to Aqaba and thence to the Red Sea has superseded the Damascus-Beirut outlet to the Mediterranean for Jordan's imports and exports.

Aqaba has great potentialities as a port. Throughout its length the Gulf is very deep to within a short distance of the shore, the average depth 650 ft out being between 50 and 60 ft. The prevailing off-shore wind enables ships to anchor close in.

The Government of Jordan, acting through the Port of Aqaba Authority, is making vigorous efforts to develop these natural advantages. General quay accommodation and services have been considerably extended, and facilities for watering, fuelling and communications have been improved until they are now of a good standard.

Unfortunately, the hinterland of the post is mountainous and the railway from Amman stops at Ras-en-Naqb, over 50 miles from Aqaba and some 4,500 ft above sea level. An asphalt road forms the last stage of the route. It is

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Fig. 2. A view under the store-loading conveyors

Fig. 3. The outlets to one of the intake hoppers, showing the chain drive to the sliding plate valves

Fig. 4. Phosphate being fed into the store on the store-loading conveyor along the elevated gallery

along this road that phosphate is delivered to Aqaba in lorries. The principal mines are at Roseifa, over 230 miles away at the other end of the country north of Amman, but others have been brought into operation to exploit rich deposits in the area of El-Hassa, about 120 miles away from Aqaba. Phosphates are brought from both areas along the main north-south railway line to the terminal at Ras-En-Naqb, where they are transferred to the fleet of lorries.

The Terminal

The terminal comprises handling, storing and shipping plant for phosphate and potash ore, and consists of two covered stores with separate intake equipment and store-loading conveyors, reclaiming equipment in the stores, store-collecting conveyors and a shipping conveyor.

The terminal has been planned with long-term prospects in mind and it will probably be many years before it is operating to full capacity. The basic requirement satisfied by the plant is for up to 20,000 tons of phosphate and 18,000 tons of potash to be held in store ready for immediate shipment. This large storage capacity makes it possible for even the largest ships to be loaded entirely out of store and, together with the high shipping rate, enables vessels to achieve a quick turn-round. The port authority will thus avoid demurrage fees.

With plenty of ground area available, the port authority chose dump storage of materials in preference to silo storage for reasons of economy. The storage accommodation and associated intake equipment is arranged so that phosphate and potash ores can be received and taken into store separately. At present, however, only phosphate is exported from Aqaba. The form of storage was designed to prevent loss of the very powdery phosphates and potash through being blown away by the wind, and also to protect them from the occasional rain which falls in the area.

The shipping-out arrangements are designed to allow high-speed loading of any of a wide variety of vessels ranging from small freighters to ships of about 20,000 tons. The plant is designed for a continuous loading-out rate of 500 tons of phosphate, or a correspondingly smaller weight of the heavier potash, per hour. The average loading-out rate for each vessel will depend, of course, on its size, on the number of holds to be loaded, and on the number of hatches to each hold, but it will always be high enough for advantageous ocean freight rates to be obtained.

The shipping tower has a retractable boom and a telescopic loading-out chute which, besides facilitating the positioning of the end of the chute in relation to the ship's hold for maximum convenience during loading, allow the boom and chute to be stowed away in safety in the tower and so protected from damage from the high winds which are experienced at certain periods of the year.

The whole terminal was designed to require very little maintenance and to incorporate simple operational techniques so that it can be run very largely by relatively unskilled labour.

Intake and Distribution

Provision is made in the design of the intake plant for arrival of phosphate and potash in a variety of lorries with capacities ranging from 10 to 30 tons.

For each store there is a ground hopper of 70 tons capacity. Phosphate and potash can be discharged simultaneously into the respective hoppers.

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Fi. . 5 (*right*). *One of the throw-off carriages*

Fi. 6 (*above*). *The two-way delivery chute of one of the throw-off ca riages seen over the head pulley*

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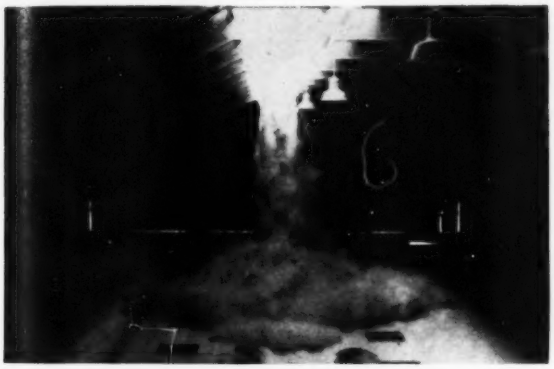

Fig. 7. Commencement of delivery into store of a batch of phosphate

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Fig. 8. About 600 tons of phosphate after delivery into store

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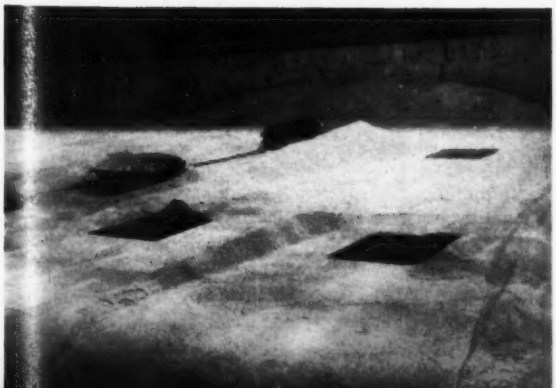


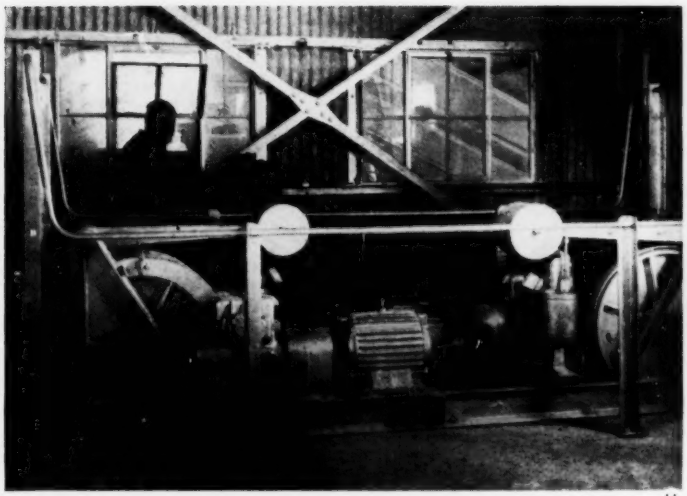
Fig. 9. Drag-scraper buckets and grids to store outlets

Each hopper has an inlet lying flush with the roadway and covered with a steel grid. The area of the inlet, and the hopper capacity, are sufficient to allow the simultaneous discharge of two lorries. This arrangement is suitable for vehicles with either end-tipping or bottom discharge. Simon handling platforms have been installed, one to each hopper, to cater for lorries with neither form of automatic tipping. Each platform is of 30 tons maximum capacity and is capable of tipping a lorry to an angle of 35 deg from the horizontal.

The intake arrangements for the two stores are identical. Each of the intake hoppers, which are of concrete, has four outlets with sliding plate valves, discharging on to a short collecting conveyor. Regulation of the discharge is by means of a single handwheel, which, through a system of chain drives, opens or closes each outlet by the same amount to ensure regular and even loading of the collecting conveyor.

The collecting conveyor delivers on to the main belt intake conveyor at an angle of 90 deg. The intake conveyor, set at an incline of 20 deg, rises above ground level and carries the ore into the store at the apex of the roof and along a gallery running most of the length of the ridge. The total length of the intake conveyor is about 360 ft.

The ore is distributed over the storage area by a belt-driven travelling throw-off carriage. The carriage has a fabricated braced steel framework with an extended tail frame carrying troughing idlers to support the rising belt. The carriage runs on two pairs of cast-iron flanged travelling wheels running in cast-iron grease-lubricated bearings, and is driven through friction gearing from the head guide pulley. The ore is delivered through a two-way chute to both sides of the conveyor and falls to the storage dumps below through steel grids. The total travel of the throw-off carriage is 131 ft and is such that when the store



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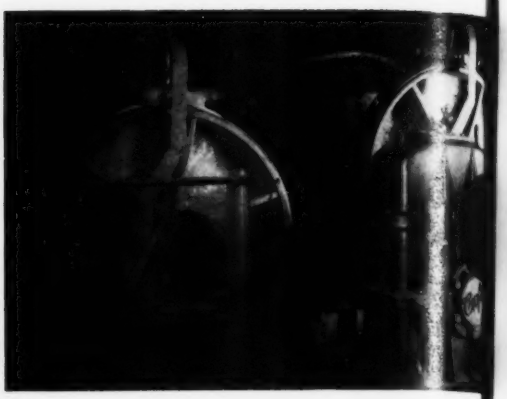

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Fig. 10. One of the double-drum-type drag-scraper winches with its reduction gear unit

Fig. 11. Drag-scraper control point in the main winch house

is fully loaded the shape of the dump will be determined by the natural angle of repose of the ore and the dump will bear only on the floor and load-carrying walls of the store.

A timber walkway with guard rails where necessary runs alongside the inclined intake conveyor and along the elevated gallery.

Reclamation

Ore is reclaimed from each store on two belt conveyors running parallel to each other along the length of the store in tunnels below floor level. There are 27 outlets in staggered formation in the floor of the store, 14 to one tunnel and 13 to the other. Each outlet is equipped with a grid, a hopper, a feed-on shoe, and dust-collecting equipment. The conveyors are fed partly by gravity flow and partly by drag scraper equipment, depending on the amount of ore in store. They deliver direct on to the shipping conveyor, which runs in a tunnel along the end of the two stores, and each has a capacity of 250 tons of phosphate per hour, or 225 tons of potash per hour.

The drag-scraper equipment is designed to have a capacity equivalent to that of one of the reclaiming conveyors, but its output will, of course, depend on the amount and the distribution of the ore in the store, and on the skill of the operator. The scraper has two crescent-shaped buckets arranged with their mouths facing each other, linked by a cable about 18 ft long. Each bucket has a capacity of two cubic yards. The scraper winch is of the double-drum type, each drum being of cast-iron with gun-metal bearings, running on a robust steel shaft and fitted with brake and clutch paths.

The scraper buckets are positioned for operation by regulation of two travelling pulley sheaves through which the main haulage rope passes. One sheave is mounted at each side of the store on a carriage running in monorail steelwork which extends along the entire length of the wall about 12 ft above floor level. The sheave carriages are hauled into position by separate electric motor-driven winches winding steel wire rope, and incorporating special devices to relieve the carriages of strain when the scrapers are in operation.

The travelling-sheave system allows the scraper buckets to be brought into alignment with two store outlets, one to each reclaiming conveyor, simultaneously. The two outlets chosen will where possible be neighbouring ones, so that only a short haul on the scraper is necessary, but if the distribution of the ore demands it, the buckets can be brought into operation on a relatively widely separated pair of outlets.

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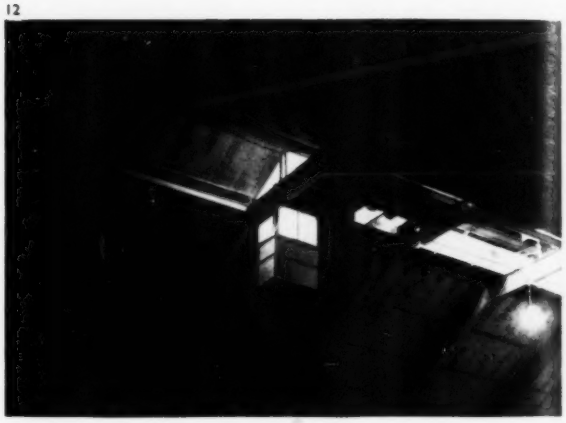


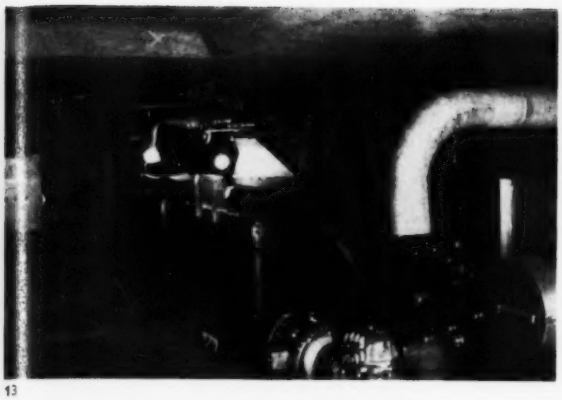
Fig. 12. Drag-scraper control cabin suspended below the elevated gallery

The drag scraper equipment can be operated from two different points: duplicate sets of controls for the scraper clutch and brake, and for the travelling sheave winches, are located in the main winch house and in a cabin suspended in the store itself below the elevated gallery walkway. The operator can thus choose the more advantageous position from which to observe the distribution and movement of the piles of ore and the location of the outlets. In both positions the operator is enclosed and views operations through a window.

Flow of ore from the hopper under each of the 27 outlets in each store is regulated by a manually controlled rack and pinion valve. The ore is diverted on to the reclaiming conveyor through 90 deg by a fixed feed-on shoe, and a branch of the dust-collecting plant is taken to each feed-on point.

Shipping-out

The shipping conveyor, which is almost 700 ft long, begins by running horizontally in a tunnel along the end of the



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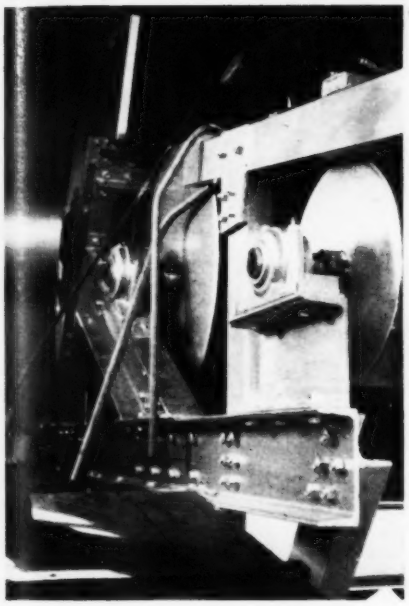

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Fig. 13. The drive end of one of the reclaiming conveyors, showing the dust-extraction hoods and feed-on shoes and one of the manually controlled rack-and-pinion valves

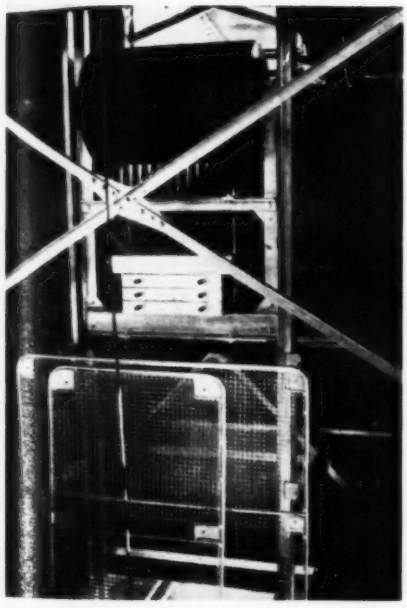
Fig. 14. Lubricating the shipping conveyor

Fig. 15. Looking back down the walkway alongside the shipping conveyor from the upper deck of the gantry between the two towers

Fig. 16. The drive end of the shipping conveyor, showing the point of delivery into the transfer chute

Fig. 17. Belt-tensioning gear in the tensioning tower

Fig. 18. The boom-retracting winch and its drive



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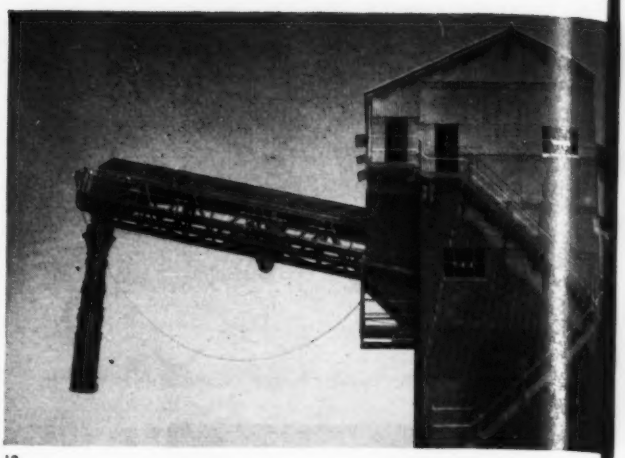
two stores. On emerging into the open at the edge of the seaward store it begins to rise at an angle of 12 deg from the horizontal. A covered gantry, supported on three legs, two of which stand on piers in the water, carries the conveyor to the smaller rearmost section of the shipping tower, which houses the belt tension equipment, and through into the main section of the tower. Here the ore is delivered over the head pulley through a chute on to a short conveyor mounted on a retractable boom. The gantry above the two towers has a corrugated asbestos roof and walls.

The cantilevered front part of the tower houses a dust-proof control cabin sited to give the best possible view of loading operations. A switch room with dust-proof ceiling occupies the first floor of the tower, while the third floor holds the driving gear for the final conveyor. In between is a runway for the retractable boom. When not in use the boom is winched back into the lower half of the deep gantry between the two towers by winch gear mounted at the rear end of the gantry next to the tensioning tower.

The ore is delivered by the short forward conveyor through a small hopper into the mouth of a telescopic loading chute suspended from the forward end of the retractable boom. The telescoping action of the chute is controlled both from the control room and from a cable-suspended control point operated at deck level by ship's personnel, who are thus able to suppress dust formation by keeping the free fall of ore into the ship's hold as short as possible.



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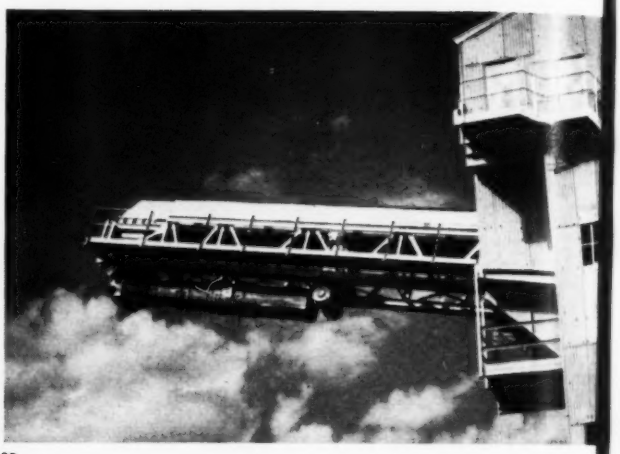

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Fig. 19. Retractable shipping-out boom fully extended with telescopic chute fully telescoped

Fig. 20. The telescopic chute winched up parallel to the shipping boom for stowing away in the shipping-out tower

Fig. 21. The telescopic chute lowered into the hold of a ship

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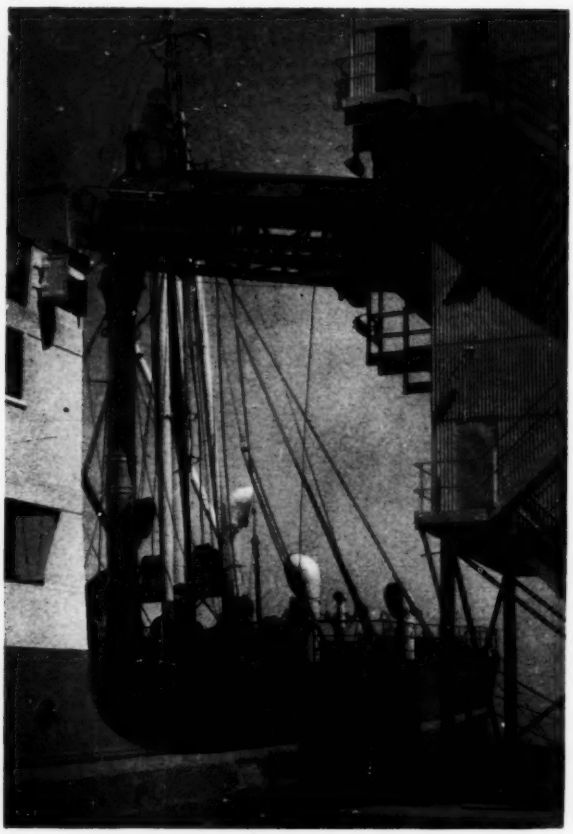


For maximum protection in rough weather the telescopic chute can be winched up by a small winch mounted on the retractable boom, so that it lies parallel with the boom, and is housed inside the shipping tower when the boom is retracted.

The shipping conveyor has a capacity equivalent to that of the two reclaiming conveyors of either store—500 tons per hour.

Dust-collecting Equipment

The phosphate and potash contain a high percentage of fines. To minimize the nuisance and at the same time to avoid wastage of material, each store has its own independent dust-collecting plant.

Each plant is located in a filter house at the end of the store, above the shipping conveyor tunnel between the two reclaiming conveyor delivery points. Ducting leads from each of the 27 store outlet feed-on shoes, and from the two feed-on shoes to the shipping conveyor, to a 64-sleeve suction filter. There are also 14 floor sweeps, situated at suitable points, in the conveyor tunnels, each with grid mouth and a weighted flap door.

A mild-steel fan driven through V-belting by a 50-h.p. electric motor exhausts the dust-collecting system. The fan is of sufficient capacity to exhaust the two shipping conveyor feed-on points and any twelve of the reclaiming conveyor feed-on points, six in each tunnel, simultaneously, though

it would be extremely unusual for the system to have to deal with all these points at once.

The collected dust is conveyed by a worm feed and via a small chute to the shipping conveyor at a point midway between the two main feed-on points.

Weighing

An automatic belt weighing machine to weigh and record all shipments of ore is housed in the shipping conveyor tunnel immediately forward of the last reclaiming conveyor delivery point. The weigher has a normal capacity of 500 tons per hour and an absolute maximum capacity of 60 lb/ft. For all normal working its accuracy is guaranteed to within plus or minus $\frac{1}{2}$ per cent.

The weigher incorporates a rate-of-flow indicator and an indicating and recording totalizer. The totalizer indicator consists of a numerical counter graduated from 0 to 999,999 tons, and the recording device of a type-setting and ticket-printing mechanism which provides a permanent record of weighments.

The automatic weighing steelyard and recording mechanism are mounted on a cast-iron base plate supported on the tunnel floor. The rotating portion of the recording mechanism is driven from a shaft rotated by the returning conveyor belt.

The weighing mechanism incorporates a patent device which automatically compensates for variations in the weight of the belt over different stretches. The total effect of such variations is computed over each cycle of the belt and an appropriate compensating adjustment is transmitted automatically to the totalizing mechanism.

Electrical Equipment

There are over 20 electric-motor drives in the plant, ranging from the small motor driving the loading-out chute telescoping winch to the two 75-h.p. drag-scraper winch motors. The smaller motors are of the squirrel-cage type and the larger ones of the wound-rotor slipring type: all are totally enclosed and fan-cooled.

Except for the control gear for the drag-scrapers, all starters for the electric motors are of the local-operated type. Interlocking contacts are provided for machines operating in sequence.

A signalling system consisting of panel lights and audible alarm is provided for communication between the operator in the shipping tower and the operator in the shipping conveyor tunnel. This system enables the shipping tower operator to send instructions on which reclaiming conveyor, or which two conveyors of the four, the feed is to be taken from.

Provision for Future Developments

The shipping conveyor and tower have been designed to be suitable for the export of phosphate rock in addition to powdered phosphate ore, as this will probably be undertaken at some future date. It will be possible to adapt the conveyor rapidly for handling rock by removing the feed-on shoes, which are of a special slide-on variety. The lower section of the reclaimed-dust delivery chute is hinged to swing upwards and thus to leave a path for the passage of rock.

If the export of rock is undertaken, it will be stored in the open and bulldozed on to the shipping conveyor.

Fig. 22. The shipping tower and mooring dolphins

NEWS OF PERSONALITIES

Colin Roseway, 34, has been appointed Burton traffic manager of Ind Coope, Ltd. Mr. Roseway was formerly personal assistant to the transport and warehousing administrator of the Home and Colonial Stores Group.

John Harrison has been appointed managing director of Atlas Copco (Great Britain), Ltd., of Maylands Avenue, Hemel Hempstead, Hertfordshire, in place of J. C. Greig, who has resigned. John Harrison has been with the Atlas Copco international group of companies for six years. He was born in 1916 at Ashington, Northumberland, and apprenticed to the Ashington Coal Co. in 1931. He stayed with this company until 1942, gaining his first-class Colliery Manager Certificate during that period.

Walter Anderson Galbraith, B.A (Eng.)., M.A. (Cantab.), A.M.I.Mech.E., has been appointed general sales manager of The Yale & Towne Manufacturing Company's British Materials Handling Division at Wednesfield, Staffs. Two promotions within the Division have been made concurrently with this appointment: **Harry Davis**, Assistant Sales Manager (United Kingdom), has been appointed sales manager (United Kingdom) and **Michael John Stuart**, assistant sales manager (export), has been appointed sales manager (export).

Mr. Galbraith, formerly Chief Sales Engineer in Babcock & Wilcox's Materials Handling Division, served with the Royal Engineers during the war, returning to Cambridge on demobilization to take his degree. He then joined Babcock & Wilcox's post-graduate course, which included two years at that company's Renfrew Works and one year

H. Davis

M. J. Stuart

in the Service and Erecting Departments. On completion of this course, he joined the company's London office, project department, before entering Commonwealth Sales. He was then transferred to Mexico, where he spent three years on the sales side. On returning to England he became Chief Sales Engineer in the Materials Handling Division.

Mr. Davis, who is a Graduate of the Institution of Mechanical Engineers, was apprenticed to Fraser & Chalmer's Engineering Works of the General Electric Company, with whom he subsequently became a materials handling draughtsman. After a period with the English Electric Company as a diesel engine draughtsman, he joined S. S. Stott, Ltd., as a materials handling designer/draughtsman. He was with J. Collis & Son, Ltd., as a technical sales representative until joining The Yale & Towne Manufacturing Company in 1955 as a sales engineer for the British Materials Handling Division. Early in 1957 he was appointed assistant sales manager (United Kingdom).

Mr. Stuart was apprenticed to The British Thomson-Houston Co., Ltd., before joining the Borneo Co., Ltd.,

J. Harrison

W. A. Galbraith

Singapore, as commercial engineer. He became manager of that company's engineering department before joining the British Materials Handling Division of Yale & Towne in 1956. Later that year he was appointed assistant sales manager (export).

Sheepbridge Equipment, Ltd., a member company of the Sheepbridge Engineering Group—announce the appointment of **J. G. Francis** as their technical representative for the Yorkshire and Lincolnshire areas. Mr. Francis, whose home address is 11 Peveril Close, Kiveton Park, Sheffield, will be responsible for promoting the sales of the wide range of products manufactured by Sheepbridge Equipment, Ltd. This range includes all types of mining machinery and equipment, quarrying plant, conveyors and mechanical handling plant, fibreglass units, and special machinery designed and built to customers' requirements.

Dewhurst & Partner, Ltd., of Hounslow, manufacturers of electro-magnetic brakes and electrical control equipment, announce the following staff appointments; **R. A. Gilbey**, A.M.I.P.E., to be general manager, Amersham Works. Mr. Gilbey was formerly works superintendent at G.E.C., Perivale, prior to which he was production manager at Sterling Engineering, Limited.

E. Ford to be Northern Regional Manager. Mr. Ford has been with the company for 11 years and was formerly North East Area Manager. He will operate from the Dewhurst Office at Newcastle.

January 1960

The above issue will contain the following articles:—

Factory Layout Planning

Handling Stores for Self-Service

Heavy Handling in Swiss Engineering Plant

Equipment at a Manchester Exhibition

Conveyor Installation in Banana Warehouse

4 Wheel Drive Loading Shovels

Handling with Industrial Trucks Part 4

and Regular Features

HANDLING EQUIPMENT FOR MINING AND SIMILAR APPLICATIONS

by T. W. HIGHGATE

BRITISH-MADE mechanical handling equipment for coal-mining and allied applications occupied much of the floor, and gallery-space, at the last Mining Machinery Exhibition, the second of its kind to be held in London since 1949. The exhibition was held at Olympia, and a preview report was published in *Mechanical Handling*, July, 1959.

The post-exhibition report, which follows, briefly describes the most important mechanical handling and similar equipments seen at the exhibition, with the exception of those already previously illustrated and described in the exhibition preview. As can be seen from the photographs, there are two main ways of using mechanical handling and allied equipment in mines underground: (*a*) in direct conjunction with coal-cutting and loading machines, and (*b*) for transportation of coal, etc., back from the face. In the first group, wide use is made of combined machines consisting of crawler tractor-mounted cutting heads, and track-mounted cutting and loading heads with self-contained conveyors. For getting coal and other materials away from the face, use is made of a variety of mobile conveyors as well as rail-mounted conveyances.

Fig. 1. General views of the 1959 Mining Machinery Exhibition

Sixty Years of Machine Mining

The massiveness and mobility of modern underground-mining machinery is typified by the machine shown in Fig. 2, the crawler-mounted Anderson-Boyes A. B. Dreadnought Universal Arc-Shearer, which combines in itself an amazing system of highly versatile coal-cutting heads for horizontal and shearing cuts. This firm has 60 years' experience of machine mining construction, and their exhibits clearly demonstrated some of the interesting trends of to-day. These included power loaders operating on the continuous mining principle, these being associated with armoured flexible conveyors, amongst them the A.B. Longwall Trepanner, the A.B. Sixteen Anderton Shearer-Loader and the A.B. Trepan Shearer. In addition, machines for cyclic mining were shown, e.g. the A.B. Meco-Moore Cutter Loader, produced jointly with the Mining Engineering Co., Ltd., which is a power loader designed to carry out simultaneous cutting and loading of coal and successfully employed for two-cycles-per-day working in some mines. Other machines shown included Longwall machines of various kinds, amongst them the A.B. Heavy-Duty Comminuting Machine for cutting and loading the whole thickness of a seam of potash in one operation, and incorporating a special articulated stowing conveyor.

Fig. 2. The A.B. Dreadnought Universal Arc-Shearer, a versatile crawler-mounted coal-cutting machine for horizontal and shearing cuts, made by Anderson Boyes & Co., Ltd.

Another long-established firm in the machine mining field, Cowlinshaw, Walker & Co., Ltd., also exhibited a range of special-purpose mechanical handling equipment. A general view of this firm's stand is shown in Fig. 4. Cowlishaw-Walker colliery equipment has been made for nearly 100 years, and coal face machinery for 60 years.

Fig. 3. British Jeffrey-Diamond armoured stage loaders

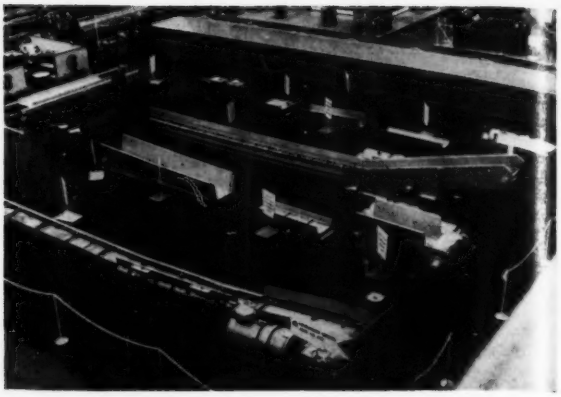


Fig. 4. General view of the Cowlishaw-Walker stand

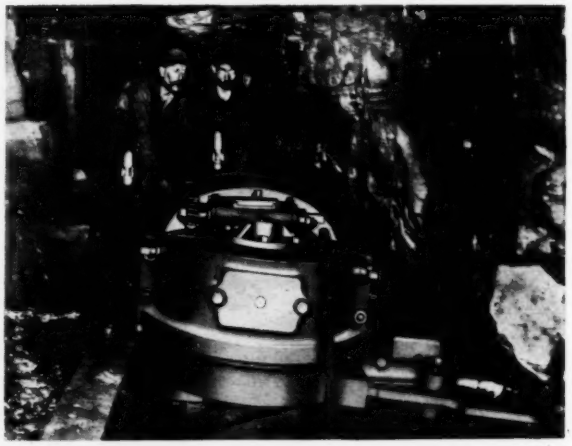


Fig. 5. Cowlishaw-Walker coal-cutter at work in the year 1902

Fig. 6. A modern Cowlishaw-Walker chain conveyor working with a cutter loader

Fig. 5 shows one of the firm's coal cutters at work in the year 1902, and Fig. 6 shows a present day chain conveyor working with a cutter-loader. This firm now specializes in scraper-belt conveyors and is one of Britain's leading manufacturers of this type of equipment.

Bunkering Conveyor

A number of bunkering conveyors were shown at the Exhibition. One of the most interesting of these was that exhibited by Cowlishaw-Walker & Co., Ltd. This machine, hydraulically controlled, with a variable speed of 0 to 10 ft/min and maximum discharge of 200 tons/hr, is specifically designed for the storage of coal, and can hold 1 ton/yd run. To achieve this capacity, twin heavy-duty sections are coupled together as shown in Fig. 7. The great advantage of this form of construction lies in the use of separated top and bottom pans dually applied, affording convenience of handling and installation. Two 20-in heavy-duty chains carry the load and these are fitted with solid forged-steel crossbars 3 in deep and spaced at 12 in centres. The chains are thus solid-riveted with bolted-in crossbars, providing a non-welded chain of great strength with extra resistance to shock loading. The conveyor is powered at the tail-end with a special twin driving unit having two individual sprocket shafts coupled to a common high torque gear-reduction unit. Motive power is provided by means of a low speed constant torque hydraulic motor fed from a variable delivery pump. This arrangement provides for infinitely variable speed up to the set maximum of 12 ft/min.

A dual-discharge unit is applied at the delivery end of the conveyor to reduce to a minimum proportions at this end, which may be elevated. In application, the conveyor may be used to bunker coal in two basic systems. Firstly, as shown in Fig. 8, the conveyor may be introduced in the line of delivery of a trunk belt to a main loading point. The conveyor is placed under the extended jib of the belt, which normally delivers on to an elevating conveyor, which feeds into tubs or mine cars. When a stoppage occurs in the haulage system, a plough is brought into action on the trunk belt, and the load is diverted into the bunkering conveyor. The load is then carried at slow speed until the bunker is filled or the haulage resumed.

With the plough swung clear, normal conveying proceeds, with the bunkered coal standing in its conveyor. This coal is then off-loaded at a suitable speed, at such time as there is a stand on the main belt, or when the normal output falls to permit reduced capacity off-loading from the bunker.

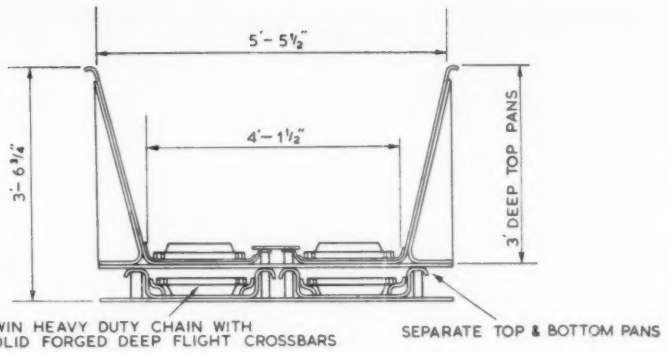
As an alternative, a second application, Fig. 9, disposes the bunkering conveyor to one side of the main conveying line. For storage, coal is diverted by a two-way chute to the bunker, traversed along, then off-loaded at some convenient time back into the conveying line.

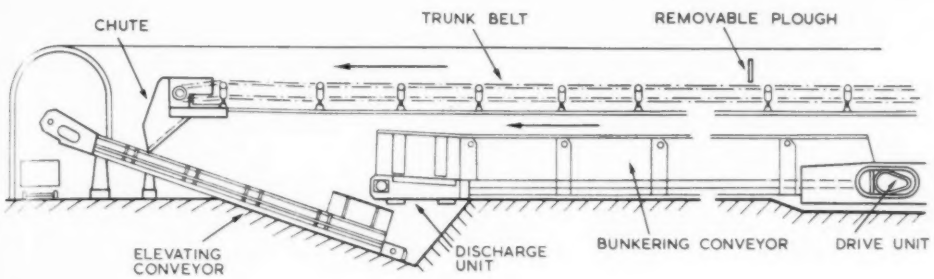
Chain speed on the bunkering conveyor is, of necessity, very low. Considering a full bunker, a chain speed of 10 ft/min will off-load at the rate of 200 tons/hr. To load the bunker to even depth it is necessary to bring the chain to

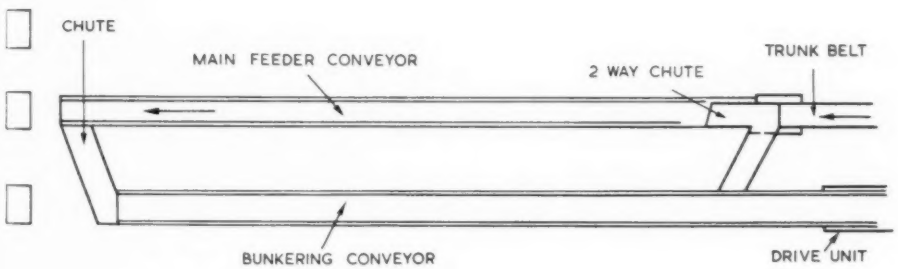
RIGHT
Fig. 7. Use of twin heavy-duty conveyor bunker sections to give 1 ton/yd coal-storage capacity in Cowlishaw-Walker bunkering conveyor

CENTRE
Fig. 8. Side elevation of Cowlishaw-Walker in-line bunkering scheme

BELOW CENTRE
Fig. 9. Plan view of Cowlishaw-Walker bunkering scheme, arranged in parallel with conveying line







rest, to fill the section under the belt discharge, then to traverse the load out of the loading area again bringing the chain to rest. This operation calls for supervision and an attendant to control the conveyor at this point. The frequent stopping and starting is fully and safely controlled through a hydraulic valve.

Quick Cage Decking

A scaled working model of a Hannico decking plant was shown by Hannico (Great Britain) Ltd. This was a pit-bottom installation incorporating cage decking with main brake, tub-release control, rams, shaft stop, tilting platform and controls. The tilting platform is stopped automatically when the cage leaves the landing, the ram controls being interlocked. This model is shown in Fig. 12.

Pneumatic Stowage

An interesting pneumatic stowage machine was exhibited by Markham & Co., Ltd. This is shown in Fig. 13. In coal mining, the cavity remaining after the removal of the coal, is packed with crushed rock, by means of pneumatic stowing equipment. The Markham machine consists of a stowing machine which measures and introduces crushed rock into a pipeline, through which the material is carried by compressed air, and then discharged at high velocity into the space to be packed. The pipeline may be led up or down gradients and round bends. The length of pipeline is usually up to about 300 yd and may be considerably longer, but best results are obtained with the shortest possible pipeline.

The Markham pneumatic stowing machine exhibited was of 120 cu. yd/hr rated capacity, and designed to solid stow in a single shift, into a face from which 400 tons of coal has been removed. It was of the 'direct-on-face' type, driven by electric motor, for use without a bend. One advantage of the machine is that a low air pressure is required, 18 to 15 lb/sq. in., so that a simple low power blower suffices. A second advantage is its ability to handle fine and sticky material, due to use of a short straight-stowing pipeline.

Richard Sutcliffe Conveyors

Richard Sutcliffe, Ltd., exhibited a very wide range of special-purpose handling equipments, amongst it, at least three items of special interest, a bunker conveyor, a hydraulic loop take-up gear for belt conveyors, and a direct-acting ram pump operating on water at high pressure and used for energizing the ramming gear of armoured chain-face conveyors and other purposes.

The Richard Sutcliffe bunker conveyor is designed to break bottleneck problems in underground handling systems. It is usually sited as near as possible to shaft bottom, the handling bottleneck most often being shaft winding capacity. The bunker conveyor capacity is stated to be small, when compared to the flexibility provided by it. In one case, a colliery producing 1,800 tons/shift, with short peak loads at the rate of 420 tons/hr, and peak loads averaging 285

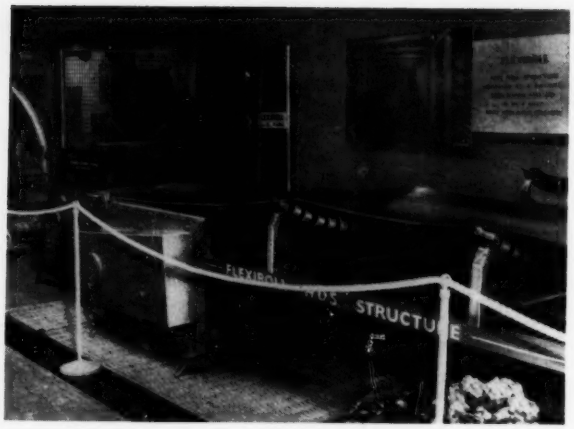


Fig. 10. Driving head of Fisher & Ludlow Flexiroll belt conveyor system, which uses fireproof conveyor idlers designed to control P.V.C. belting under all loading conditions. Graphite-impregnated nylon bearings are used.

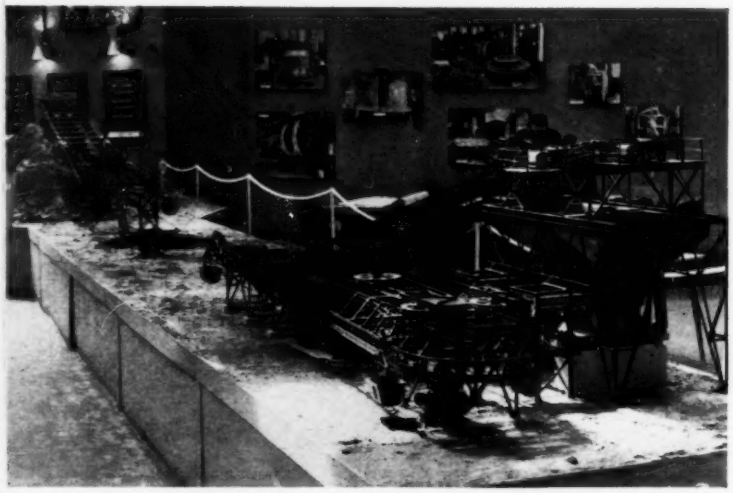


Fig. 11. Working model of a fully-automatic bicable aerial ropeway system as widely used for dirt disposal throughout the world, shown by the British Ropeway Engineering Co., Ltd.

tons/hr, in any one period of 60 minutes, a bunker conveyor of 120 tons capacity proved to be ample, although the maximum amount which could be handled by the shaft was only 220 tons/hr.

In the past, attempts had been made to use bunker conveyors in service with the rest of the handling system. These are stated to have been unsuccessful. The Sutcliffe bunker conveyor works in a different manner. It is a by-pass unit, and is located under one of the main conveyors. It receives coal only when bottleneck capacity is exceeded, and the discharge to the outbye unit is always at the pre-determined rate, the surplus being stored in the bunker conveyor by progressively moving the point of feed inbye, as required. It can be installed at any suitable point in a roadway of little more than average cross-section, and is cheaper to install and operate than a vertical staple-bunker excavator in the strata.

The Sutcliffe bunker conveyor was shown in the form of a working model, Fig. 17. Fig. 18 shows an actual installation underground being filled with ripping dirt. The machine is a combination of storage bunker and fixed-rate feeder and owes much of its success to use of a novel method of propulsion by hydraulic rams. These occupy a minimum of room and provide shockless and almost noiseless power. Hydraulic power from the same pumping unit also powers the chain tensioning gear and the travelling plough of the conveyor bunker.

Normally, capacity is 120 tons and overall length is 200 ft. For bulk storage on the surface, bunkers of 800 tons capacity are planned. Operation is as follows: coal is fed to the bunker by 42-in conveyor, being deflected by travelling plough into the bunker, at any point along its 200 ft length, plough movement being by ropes and pulleys driven by hydraulic surge wheel. Plough control is by two pull wires which run full length. The bunker conveyor system functions in three ways: (*a*) with the plough at the front, the bunker can be by-passed, whether full or empty; (*b*) with the plough at the rear and with the bunker working, 100 tons of stock can be maintained as long as supply equals demand and (*c*) if an interruption occurs in winding, the bunker can be filled from front to rear, or from rear to front, by moving the plough back from the front end, or from rear to front, respectively.

At the Exhibition, the Sutcliffe hydraulically operated conveyor belt loop take-up was shown in use on a Goliath model 50 conveyor.

Fig. 20 shows a Sutcliffe automatic hydraulic loop take-up unit. Automatic belt take-up gear is comparatively simple on surface conveyors, where unlimited headroom allows easy insertion of a dead weight tension-gear at any suitable point. This condition rarely applies underground, while in addition, the need to add lengths of belt to extending-gate conveyors causes complications in installation and operation. The normally accepted method of providing for both initial tension and extension of the conveyor is the loop take-up gear, introduced some thirty years ago by the late Richard Sutcliffe, in which a long horizontal loop of belt is stored in a suitable frame attached to the driving unit, and is both paid out for extension purposes, and taken in to increase initial tension by the use of a hand-operated winch.

However, in inexperienced hands, the winch gear can provide a too-ready means of applying excessive tension to the belt with consequent detriment to its life,

(*Continued on page* 731)

Fig. 12. Working model of a Hannico decking plant for installation at pit bottom. This is designed to handle mine cars safely, giving quick cage decking

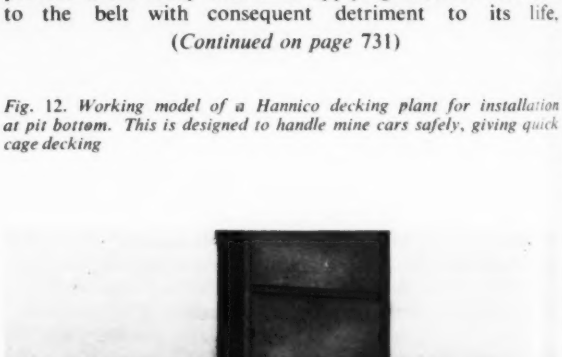


Fig. 13. Part of the Markham stand, showing their pneumatic stowing machine

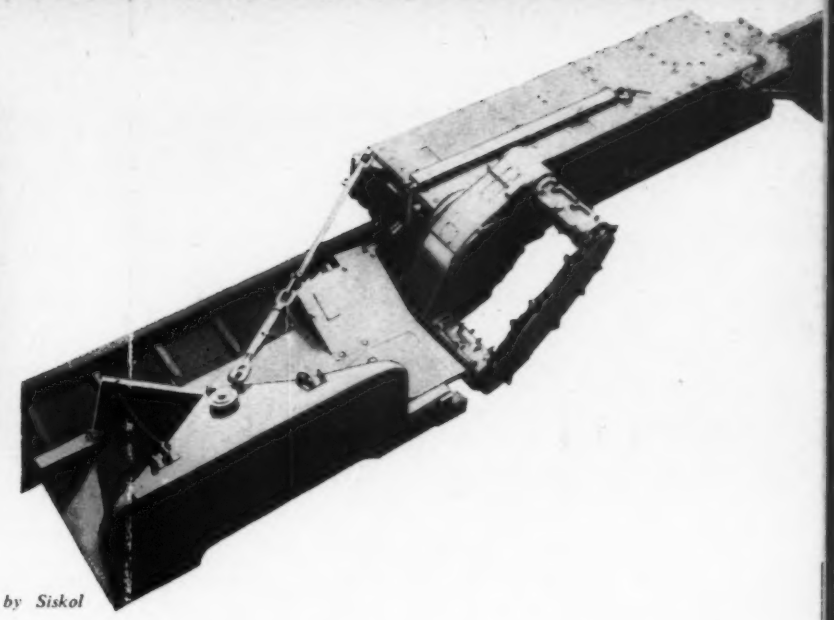


Fig. 14 The new Muschamp coal-winning machine, shown for the first time. This is a conversion unit for Anderton Shearer machines and is designed to produce a reasonable percentage of large coal as cheaply as possible. It is made by N. J. Muschamp & Co., Ltd.

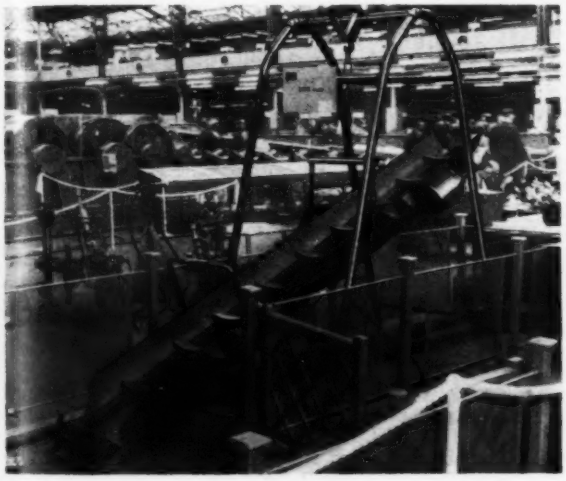


Fig. 15. Siskol Kata loader, exhibited at the Exhibition, by Siskol Machines Ltd.

and to obviate this undesirable feature, the hydraulic loop has been introduced. In this arrangement the pull of the belt in the loop is taken on one end of a pivoted lever, the other end of which is supported on a calibrated spring which has been preset at the required figure. This in turn determines the maximum load that the belt is required to transmit. Should the tension in the belt rise above the predetermined figure, the spring is further compressed, thereby operating a piston valve which controls the supply of oil from a small pump driven from the input of the driving unit, and which is used to operate a hydraulic motor providing power for the winch gear. Thus compression of the spring operates the valve in the 'pay out' direction, and when sufficient belt has been paid out to allow its tension to fall to normal, the spring returns the valve to the neutral position and winch motion ceases. Conversely, insufficient belt tension causes belt to be wound in as required. And under all conditions of use or misuse, the tension in the belt cannot rise above the predetermined figure, which, being within the recognized limits of safe loading, gives the maximum possible protection for the belt and hence an increase in its life.

Similar advantages are derived from the use of hydraulic power to operate tub and mine car control gear. A typical example on display was the Sutcliffe Tub Puller, consisting of two guided pushers with counterweighted horns operated by automatically controlled hydraulic cylinders disposed between the rails. This can be arranged to operate automatically once the valve is put in the "on" position, and a string of tubs or mine cars will continue to feed through thereafter without interruption, see Fig. 22.

In mining operations there are many instances when water is required to be pumped at high pressure where some type of ram pump is the obvious choice. A typical and growing use for these pumps is the energization of ramming gear on armoured chain-face conveyors, which make use of mine water to which soluble oil has been added to minimize corrosion. To fill this need, and at the same time to eliminate the cumbersome treble ram pump, a Sutcliffe direct-acting water pump has been developed. This aroused considerable interest at the Exhibition. Its basis is a self-contained power pack, in which an electric motor drives a rotary oil pump, which supplies oil at pressure to a double-acting cylinder, the piston of which is connected to a yoke driving the two pistons of the water-pumping cylinders. As the oil cylinder is provided with an automatic instantaneous reversing valve, the delivery of water is maintained practically continuously and in an unvarying quantity. As the whole of the equipment is mounted on the power pack, movement, as the face advances, is a very simple operation.

Hydraulic power is also used to advantage in the operations of Sutcliffe armoured chain-face conveyors, particularly in situations where electric power at the face is inadmissible. The ability to locate the prime mover at any convenient and safe point in the main roadway reduces congestion of the face at the driving unit through the elimination of bulky electric or compressed-air motors and their accompanying gearboxes. This reduction in physical size of the driving head renders roof support much easier and proves a valuable asset where roofs are comparatively weak.

The arrangement consists of a comparatively small

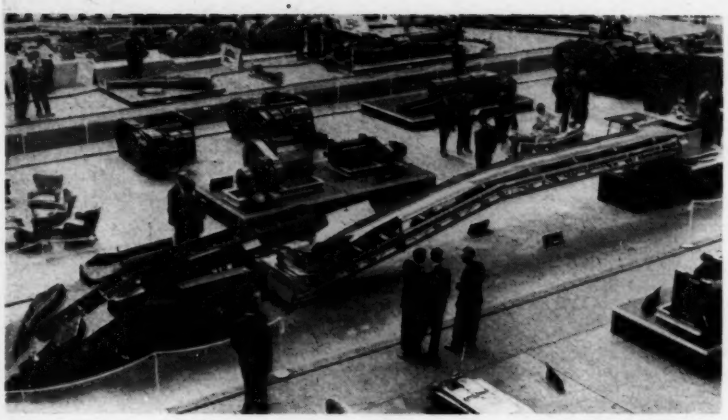


Fig. 16. General view of Mavor & Coulson stand, with new bridge conveyor in foreground. This machine was described in the Mining Machinery Exhibition preview, published in Mechanical Handling, July, 1959

driving head frame containing the chain sprocket and a small box containing one set of spur gears, the pinion of which is coupled to a slow-speed hydraulic motor by means of a claw coupling. Oil is supplied to this motor from the power pack in the gate which makes use of a triple pumping unit controlled by a simple valve which allows the selection of normal running speed, and two lower speeds for use when the return strand of the conveyor might be choked with gummings, and a high torque is temporarily necessary. The same valve allows the conveyor to be stopped, although the electric motor and its pumps still continue to run. A second valve gives reverse direction of the chain in case this is necessary and it will be seen from this that complete control over the conveyor can be exercised without stopping the electric motor until the end of the working shift. The reduction in maintenance of the electrical gear as a result of this facility is, of course, considerable. Provision is made for extension of the pumping lines between the power pack and the conveyor, by using a combination of permanent steel pipes and self-sealing couplings, to eliminate loss of oil during extension of the pumping range. Flexible hoses are also provided to allow for considerable manipulation of the position of the driving unit without disturbing the steel pipes.

Apart from the reduction in conveyor size, the hydraulic armoured chain-face conveyor requires very much less power than an equivalent pneumatically operated conveyor. Where collieries are not provided with compressed air its use is, of course, invaluable. A further advantage is the fact that the same power pack is used for the propulsion of the conveyor by hydraulic rams on the face.

Hugh Wood Conveyors

Hugh Wood & Co., Ltd., displayed a representative range of mechanical handling equipment for mining and allied applications on two large stands. Huwood conveyors cover the full range of underground working conditions. At the exhibition only one Huwood conveyor was shown in motion, the TB80, which embodies quadrupartite construction of the drive head, i.e. its division into power unit, reduction gearbox, and two separate single-drum units. This method of construction offers considerable advantages in operation, assembly and transport. The conveyor has loop take-up designed for automatic tension. Another interesting exhibit was the 'Featherbed' tail and receiving hopper. The Huwood 'Featherbed' idler, incorporated into this hopper, consists of a coil spring suspended on end bearings, and this gives to the load and helps to reduce belt wear.

Of the other Huwood belt conveyor exhibits, by far the most prominent was the TB200 drive head, one of the largest drive heads made by Hugh Wood & Co., Ltd., and made for the heaviest type of trunk conveyor. Within

Fig. 17. Working model of Sutcliffe bunker conveyor

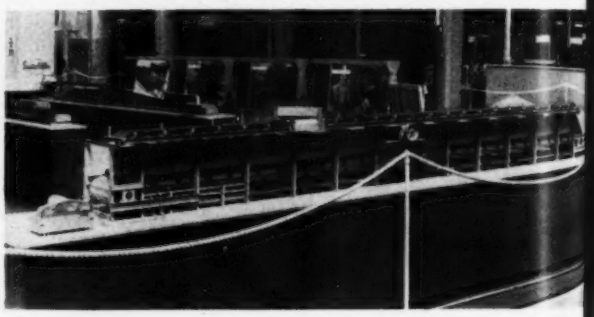


Fig. 18. Sutcliffe bunker conveyor, showing bunker being filled with ripping dirt

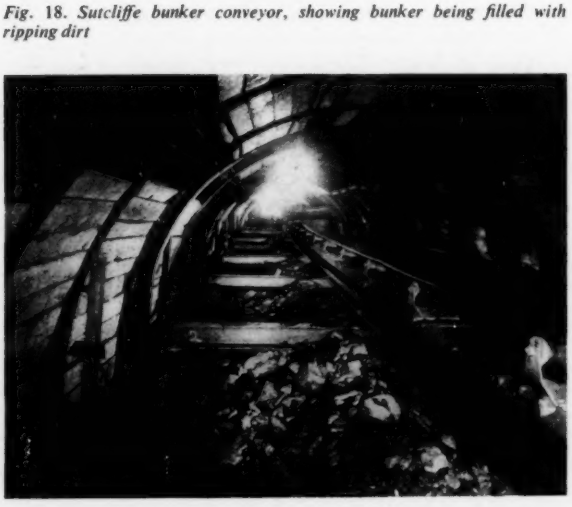


Fig. 19. Sutcliffe bunker conveyor, empty

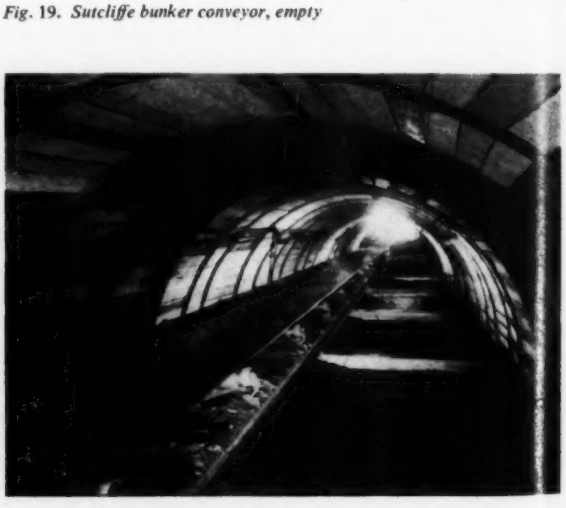
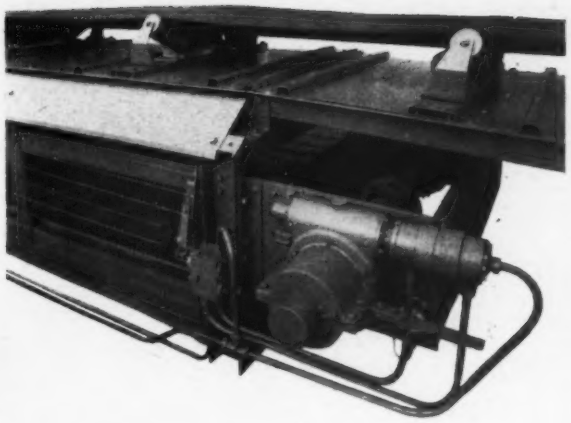


Fig. 20. Sutcliffe automatic hydraulic conveyor loop take-up unit



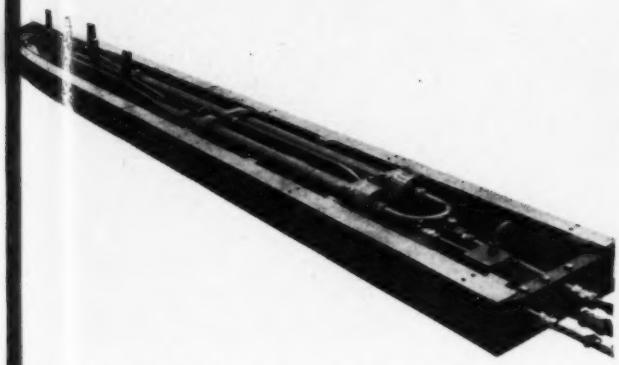


Fig. 22. Sutcliffe hydraulically operated Tub Puller

Fig. 21. Sutcliffe hydraulically driven 'Armadillo' conveyor

recent years Hugh Wood & Co., Ltd., have developed a series of drive heads specially designed for use in surface installations such as washery plant, plant for waste disposal, etc. These heads are designed to transmit from 5 to 50 horsepower and are available for both wide and narrow belting. Two of these drive heads were shown at the Exhibition, type 10W and type 50W. Huwood drive heads for surface installation can be used with any of the mining conveyor sections shown in the stands, and with any of the tail-ends, should these be required, but most surface installations required a rather simpler system in which idler sets are mounted on a framework and in which the tail-end consists of a simple Huwood return pulley fitted with a means of tensioning.

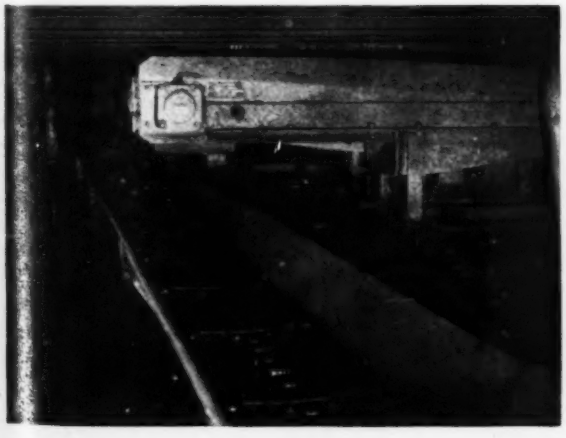
A number of Huwood chain conveyors were also shown, one of them in motion, the armoured Python conveyor. Belt-conveyor gearboxes were shown too, model SL/3 gearbox for belt conveyors, which is interchangeable between a number of face and gate conveyors, and model P40 gearbox, which has a range of uses on various Huwood conveyor drive heads.

Signalling System

The new Hugh Wood concentric signalling system as shown, at the Exhibition, has a wide range of application, not only in collieries, but in every industry using conveyors, or any form of mechanical haulage other than locomotive haulage, or possibly in any installation where moving parts out of sight of the operator could be a source of danger. In addition to its widespread use on underground haulage roads, this system is stated to be rapidly gaining recognition in industry and in power stations, and gasworks.

The signalling system is interlocked with the control apparatus of either haulage or conveyor, and 'fails to safety' under all conditions of fault. A broken signalling wire or other fault immediately stops the conveyor or haulage. The system was designed for use on A.C. circuits, and in addition to meeting the requirements outlined above, it offers the advantage of an unusually neat, compact, and relatively inexpensive layout. It can be used on either bare wire or with the concentric signalling cable, and can operate to the length of approximately three miles.

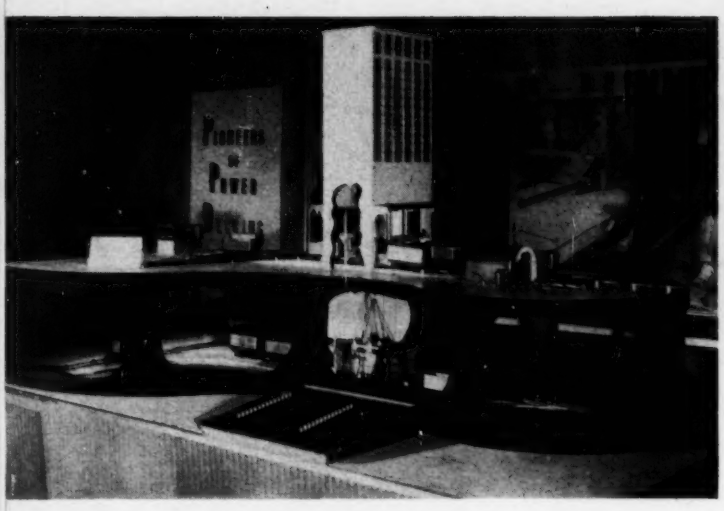
Fig. 23. A Huwood HS/6 conveyor in a colliery. It is made by Hugh Wood & Co., Ltd.



Pioneers of Power Decking

One of the most interesting of the exhibits was that on the stand of Westinghouse Brake & Signal Co., Ltd., which consisted of a working model of a most comprehensive type, being designed to demonstrate, in principle, the entire range of Westinghouse colliery equipment. A prominent display panel pointed out that Westinghouse pneumatic equipment had been installed in more than 25 per cent of the principal coal mines in Great Britain, and that more than 700 scheme orders had been carried out for the National Coal Board. Fig. 24 shows the working model on the Westinghouse stand, and Fig. 25 gives a close-up view of part of the exhibit.

Westinghouse colliery equipment is, of course, well known in the mining industry and brief notes on this equipment may be of general interest to non-mining readers of this review. The equipment is supplied either as separate units or as completely interlocked schemes, and is for the handling of empty or laden mine vehicles, both underground



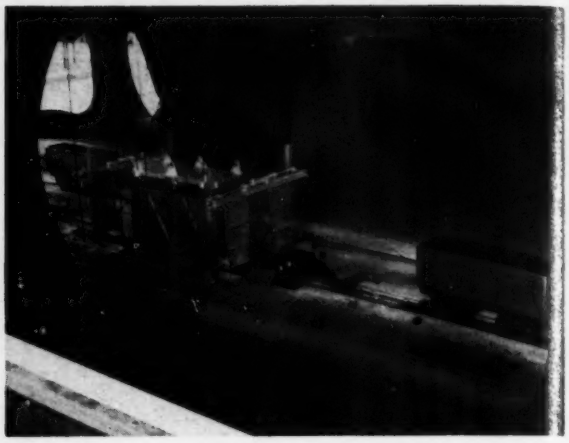


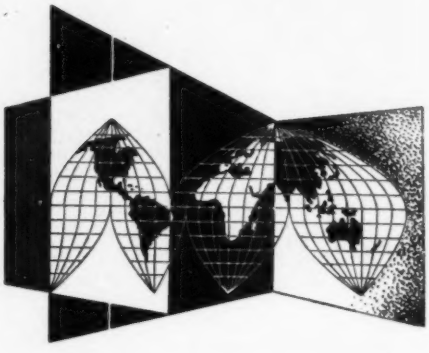
Fig. 25. Close-up view of part of the Westinghouse exhibit, showing the treadle-operated retarder and catches, which ensure rapid slow-down of mine cars approaching the cage

Fig. 24. The working exhibit on the Westinghouse stand, showing some of the pneumatic colliery handling devices made by the firm

and on the surface. Generally, the equipment is operated by compressed air at 60 to 80 lb/sq. in. pressure, this being to provide simplicity and flexibility, control being either manually or automatically interlocked, electro-pneumatic control also being available. Flame-proof or intrinsically safe equipment is available, for use where necessary.

The use of Westinghouse equipment enables mine car handling at new pits to be operated on modern lines and existing pits to be reorganized to conform with this ideal. In many cases, claim the manufacturers, greatly increased shaft outputs can be obtained in this way. Among the most important applications of Westinghouse colliery equipment, the following may be mentioned, (*a*) the use of power decking to economize on time and manpower by eliminating manual decking of mine cars; (*b*) the simultaneous decking of multi-stage cages; and (*c*) car steadying and centreing during decking operations.

BRITISH MECHANICAL HANDLING EQUIPMENT OVERSEAS



UGANDA
Bagging graded coffee at the new plant built for the Bugisu Coffee Board, where some 22 processing machines, drivers, hullers, cleaners and graders are served by 1,300 ft of Redler and RB conveyors and elevators

Le matérial britannique de manutention mécanique se trouve en service dans la plupart des pays du monde. Chaque année, depuis la fin de la guerre, le chiffre des ventes à la clientèle des pays d'outremer s'est accru. Des acheteurs venus de tous les pays du monde accourent aux Expositions de la Manutention Mécanique (organisées par notre publication), qui ont lieu tous les deux ans à Londres, si haute est l'estime que l'on a pour le matériel de fabrication anglaise.

Dans cet article, à suivre tous le mois, nous vous présenterons des détails succincts et des illustrations du matériel anglais spécialement étudié pour et mis en service dans les pays étrangers.

Nous invitons cordialement les lecteurs de l'étranger à écrire à notre Rédacteur en Chef (The Editor) pous tous renseigements concernant un type quelconque de matériel anglais de manutention mécanique, ou les noms de fabricants, agents distributeurs ou représentants dans un pays donné.

Britische Förder- und Hebegeräte befinden sich in den meisten Ländern der Erde im Einsatz. Seit Kriegsende steigern sich die Verkaufsziffern an ausländische Abnehmer von Jahr zu Jahr. Ein so grosses Ansehen geniessen Geräte britischer Herstellung, dass ausländische Käufer anlässlich der alle zwei Jahre von dieser Zeitschrift in London veranstalteten förder- und hebetechnischen Ausstellungen in Strömen herbeikommen.

In dieser monatlich fortgesetzten Artikelserie werden wir kurzgefasste Einzelheiten und Abbildungen britischer Geräte bringen, welche für das Ausland konstruiert bzw. dort bereits im Einsatz sind.

Ausländische Leser, welche an Auskünften über britische Förder- und Hebegeräte gleichwelcher Art, bzw. an Namen und Adressen der entsprechenden Hersteller, Agenten und Vertreter in irgend einem gegebenen Lande interessiert sind, werden gebeten, sich schriftlich an die Redaktion zu wenden.

TANGANYIKA →

This 22-ton cell-curing kiln, from Strongwork Engineering, created something of a transport problem when it arrived at Tanga, Tanganyika. The problem was to carry this cumbersome load from the wharf to its site at Sikh Saw Mills, a route which included almost half a mile with a 1 in 30 gradient. International Harvester distributors, Dalgety & Co., Ltd., of Tanga, came to the rescue with the new British-built B9450 tractor which managed the job comfortably without using wheel weights or any form of ballast

British mechanical handling equipment is to be found working in most countries of the world. Each year since the end of the war, sales to overseas customers have increased. Buyers from overseas flock to the Mechanical Handling Exhibitions (organized by this journal) held every two years in London, so great is the regard for British-made equipment.

In this feature, to be continued each month, we shall bring you brief details and illustrations of such British equipment designed for, or at work in, countries abroad.

Overseas readers requiring information on any type of British mechanical handling equipment, or names of manufacturers' agents or representatives in a particular country, are invited to write to the Editor.

←**BRITISH GUIANA**

Mercury Model 20 ACD fitted with air-cooled diesel engine. One of a fleet operated by Bookers Shipping & Trading Co., Ltd., in Demerara, British Guiana

En la mayoría de os países del mundo puede hallarse funcionando equipo británico de manejo mecánico. Desde que terminó la guerra la venta de tal equipo a los compradores de ultramar ha venido aumentando sin cesar. Tan considerable es la estima en que se el equipo de fabricacion britanica en todo el mundo, que son numerosísimos los compradores extranjeros que se personan en Londres para visitar la Exposición de Manejo Mecánico (organizada por esta Revista) que se celebra cada dos años.

En esta sección, que aparecará todos los meses, les ofreceremos ligeros detalle- e illustraciones de tal equipo británico diseñado para países extranjeros o funcionando en ellos.

Los lectores de ultramar que requiran información sobre cualquier equipo británico de manejo mecánico, o el nombre del agente o representante de los fabricantes en cualquier país en particular pueden escribir pidiéndola al Director de esta Revista.

CANADA

Two travelling 'marine leg' grain-discharging plants at Montreal for the Canadian National Harbours Board. Mounted alongside the marine legs are pneumatic suction plants supplied by Simon Handling Engineers, Ltd., through Simon Engineering Companies of Canada, Ltd.

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HOLLAND

Carrying a heavy log on a Rapier Super fork truck from the ship to storage at Rotterdam

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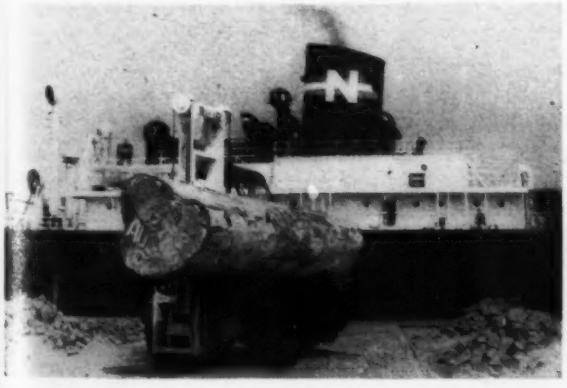
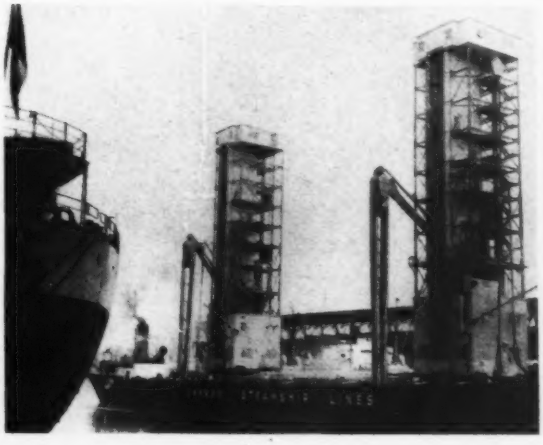




REVIEW OF NEW EQUIPMENT

NEW TANDEM CRUSHING AND SCREENING PLANT

After six months' field testing a new *Cedarapids* tandem crushing and screening plant is announced by the Iowa Manufacturing Co., Cedar Rapids, Iowa, U.S.A. It follows the design of the *Cedarapids* Commander plant but incorporates larger components to give it a capacity of up to 500 tons/hr of 1 to 4 product sizes. The most important component is the 12 × 36-in twin-jaw crusher which gives 40 per cent more screening capacity than that of the Commander. The elevating return wheel is 12 in larger in diameter and 5 in wider, and the conveyors are 36 in, or 6 in wider, to handle the greater circulating load.

Portability is not sacrificed, as when necessary the plant can be fitted with a third air-suspension axle that will carry a load equal to that of the tandem axles and reduce axle load to under 18,000 lb. With feeder and hopper removed, the weight on each of the three axles is under 16,000 lb. The plant can be fed by a plant-mounted feeder and hopper or by a ground level feeder and hopper with swivel drive. Other features include simplified drives, new belt wipers and an optional 48 × 10-in pre-screening attachment that allows the plant to produce 100 per cent crushed material. A spray bar washing attachment, to produce washed aggregate, and a 12-in dia by 4-ft 6-in long sand ejector, to handle wet or dry sand, can also be fitted.

Dealers are John Blackwood Hodge & Co., Ltd., 25 Berkeley Square, London, W.1.

After thorough field testing in America this Cedarapids tandem crushing and screening plant is now available in this country

RESISTANCE-HEATED VACUUM FURNACE

For the heat treatment of such metals as molybdenum, titanium, tungsten, stainless steels, and high-temperature alloys, including nimonic, a new vacuum furnace is said to be the first in which the charge can be heated and quenched without exposure to the atmosphere. The furnace is resistance-heated by a molybdenum winding which can raise the temperature of the hot zone to a maximum of 1,500 deg C. Insulation is by radiation shields and the furnace chamber is water-cooled. Below the furnace chamber is a trap-door leading, via a sealed hood, to the quenching tank. There is an atmosphere of argon inert gas in the hood at about atmospheric pressure.

The hot zone is 24 in in diameter and 24 in high, and the charge is hung in a basket from the lid. Air is then exhausted from the chamber with a 10-in oil diffusion pump of 2,500 l/sec capacity at 10^{-4} mm, Hg, backed by a standard mechanical pump. The temperature of the hot zone is then raised and controlled as required, and when the charge is ready for quenching argon is admitted to the furnace chamber. When the pressure inside equals that in the sealed hood below, the bottom trap falls open and the charge basket is automatically released and falls into the quenching tank. The release and quench operation takes about 5 secs. The whole cycle takes from 20 to 60 min, according to the thermal capacity of the charge and the temperature to which it is raised.

Manufacturers are Vacuum Metallurgical Developments, Ltd., Shelford, Cambridge.

The new vacuum furnace introduced by Vacuum Metallurgical Developments, Ltd., for heat treatment of metals

UNIVERSAL BOILERHOUSE ELEVATOR

The Hodgkinson Group of Companies announce that Bennis Combustion, Ltd., Little Hulton, Walkden, Manchester, are now manufacturing the new 8-in Universal elevator for boilerhouse applications. Of the chain and bucket type, designed to handle the usual boilerhouse fuels at rates up to 1½ tons/hr, it is otherwise dissimilar to conventional elevators. Standardization is the keyword, resulting in many exclusive advantages, not the least being low installation and maintenance costs. Any length of elevator for any inclination between 60 deg and vertical can be built up from standard components, and the design is so simple that an elevator can be bolted together and lifted into position in a matter of hours.

There are five basic units: feeding mechanism, boot, lower section, mid-section and head, which incorporates the drive. The standard mid-sections are approximately 8 ft long, but smaller sizes are available so that any particular length can be built up. A special curved section can be supplied where site conditions make a vertical elevator necessary. A new type of feeding mechanism is incorporated which cannot be jammed by extraneous matter since there is neither ram nor paddle, simply a flat oscillating plate. The body is hinge-mounted at the base and head so that a high degree of

ccuracy at the floor of the pit is not necessary, and small site adjustments to he slope of the elevator can be made asily during erection.

LARGE-CAPACITY CONCRETE MIXER

With an output capacity of 10 cu ft and batch-mixing time of 30 sec, the new Plow-Mixer plant will mix semi-dry mixes to 0·35 water-cement ratio, lean mixes and stabilized soil as well as producing the usual types of concrete. It is powered by a 2-cyl diesel engine of about 15 h.p.

It consists of a cylindrical body with Diamite liners and central horizontal shaft. Specially shaped blades at each end of the shaft work the mix to the centre where curved paddles knead it, and discharge the mixed material, leaving the drum clean. Loading is done by a 15 ft-capacity runway-type hopper with chain drives and wire rope. A 14-gal ball float tank automatically discharges the correct amount of water as it is needed.

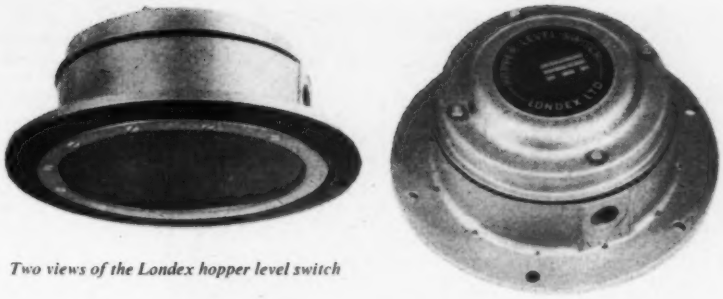
The Plow-Mixer, which has provision for batch weighing and mechanized loading from dragline scraper, has a 42-in discharge height, ideal for dumpers, and weighs about 3 tons. Other features are one control lever for hoist and brake, rugged construction, simple maintenance and easy accessibility.

The makers, Frederick Parker, Ltd., Viaduct Works, Catherine Street (Extension), Leicester, will be showing this new plant among their other productions at the Olympia Building Exhibition.

A Parker Plow-Mixer concrete mixing plant in operation at a building site

HOPPER LEVEL SWITCH

A simplified and improved version of the Londex hopper level switch has been introduced by Londex, Ltd., Anerley Works, 207 Anerley Road, London, S.E.20, and offered at almost half the price of the older model. It operates electrical contacts when bulk materials press against a diaphragm which is backed by a metal plate, so that, although the unit is sensitive, considerable force can be applied against it without damage.

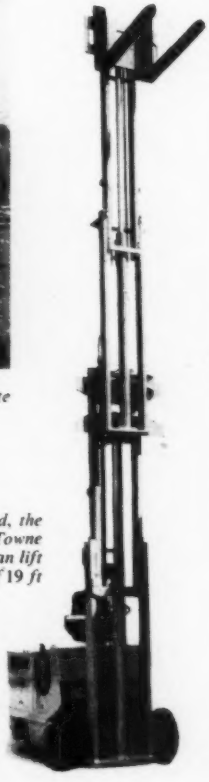


Two views of the Londex hopper level switch

The switch is of very robust, dust- and damp-proof construction but sensitive to materials of low bulk density. The housing is a machined brass casting with plated internal mechanism, dust-proof mounting gasket, and, for electrical connection, a ¾-in conduit entry or, for pressurized hopper applications, a ¼-in B.S.P. entry for a pressure balancing line connection. Single-pole change-over snap-action contacts wired to a 3-way terminal block permit the normally open, normally closed or change-over contact to be utilized.

The switch is made in two forms, standard model STA and sensitive model SEN, the choice depending on bulk density of material, but both having varying sensitivity adjustment. The standard diaphragm is of tough rubber but P.T.F.E. diaphragms, with hard-wearing and non-adhering properties, can be supplied.

The switch can be used for controlling the level of material in a container or for indicating it by controlling signal lamps or audible warning device. Other uses include control of elevating and conveying machinery automatically in response to fluctuating level in a hopper, to indicate on elevator boots and conveyors high or low level for emergency shut-off of machinery in case of over feeding or choking, and, for weighing and blending devices, to shut off feeders or automatic weighers if the feeding hopper is not filled to an adequate level. Switches mounted in various parts of a plant can also be connected to a centralized indicating and control panel.



RIGHT

When fully extended, the new Yale and Towne electric fork truck can lift a load to a height of 19 *ft*

QUADRUPLE LIFT TRUCK

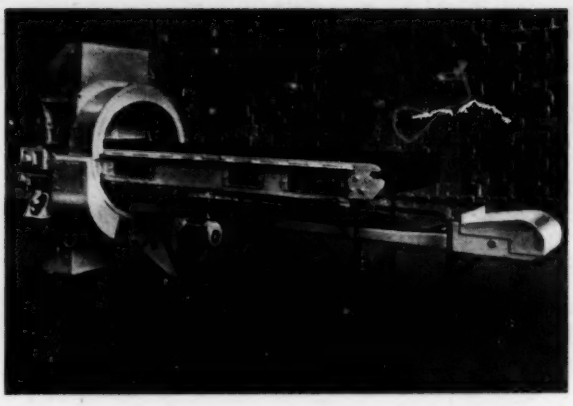
To obtain extra high stacking while maintaining low headroom requirements at the Crawley, Sussex, factory of Vitamins, Ltd., the British Materials Division of the Yale and Towne Manufacturing Co., Willenhall, Staffs, has produced a quadruple-lift Series 51 electric fork truck. It has an overall height of only 88 in, yet is capable of lifting a load of 1,120 lb at 27-in centre to a height of 19 ft.

The quadruple-lift attachment is based on specifications produced by Yale and Towne's Philadelphia, U.S.A., plant. It consists of a simplex telescopic set of secondary channels bolted directly to the primary fork carriage. It is easily removable when the extra lift is not required or when additional capacity is needed. The primary channel assembly used with the attachment has special roller spacing and oversize rollers to compensate for the stresses due to the extra high fork lift.

The quadruple and primary lifts are actuated independently. Therefore the attachment forks may be raised to obtain free lift and then lift the primary carriage to obtain stacking height. A restricted range of forward tilt has been provided for engaging the pallet and levelling the load.

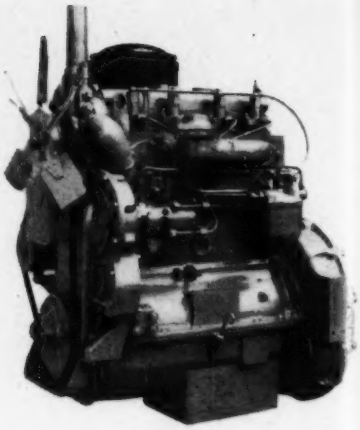
CHAIN GRATE ASH EXTRACTOR

The Riley automatic ash extractor recently introduced by Riley (IC) Products, Ltd., 19 Woburn Place, London, W.C.1, has been developed as a standard item for installation with most sizes of Riley type T



LEFT

The Riley automatic ash extractor recently developed for installation with the makers' chain grate stokers



RIGHT

The four-cylinder 60-b.h.p. diesel engine recently added to the Perkins industrial range

chain grate stokers. It is of conveyor type, so designed that there is very limited wear on moving parts since the ash is stationary on the apron plates and moves in relation to the link conveyors. The conveyor travels at a constant speed of 3½ in/min, driven by a separate gear assembly comprising an ¼-h.p. geared motor with a reduction of 1,440/0·9 r.p.m. and a further 3 to 1 reduction gear train, giving a front shaft speed of 0·32 r.p.m. A spring-loaded clutch, with the driven half on a splined shaft, protects the gear assembly from overload. Provision is made for tensioning the conveyor.

A steam cleaning assembly, operated for about 15 seconds per week and using less than one pound of steam in the process, removes fine particles of ash which penetrate to the inside of the extractor. The ash box at the front of the stoker provides for an ash chute to a water trough conveyor, but it can be fitted with a draw-plate for discharging ash into a low trolley or pan with runners attached.

The automatic ash extractor eliminates frequent opening of ash doors and thus prevents ingress of air which cools the furnace gases and reduces efficiency. Forced draught fans do not have to be stopped while ashing is in progress, and there is, of course, great saving in labour. In plants where automatic control is desirable, an ash extractor is the complement of a coal bunker or conveyor for charging the stoker hoppers.

ANOTHER PERKINS DIESEL ENGINE

Suitable for many different industrial applications, the new Four 203 diesel engine introduced by Perkins Engines, Ltd., Peterborough, is a 4-cylinder unit of 3·6-in (91·44-mm) bore, 5-in (127-mm) stroke and 203·5 cu. in (3.33 litres) capacity. For variable speed applications it is available with a hydraulic governor and rated up to 60 b.h.p. at 2,400 r.p.m. and develops up to 47 b.h.p. at 2,000 r.p.m. for continuous use when fitted with a mechanical governor. The compression ratio is 17·4 : 1.

An important feature is the method of meeting power take-off requirements. Timing is accomplished through a geared drive, which gives improved running conditions and allows power take-off from the gearing at two points. Provision is made for mounting off the camshaft gear a hydraulic pump with capacity of up to 17 g.p.m. at 1,700 p.s.i. to operate main hydraulic equipment, and for a hydraulic pump beneath the fuel pump, particularly suitable for connecting up power-assisted steering systems.

Other features include chromium-plated steel thin-wall cylinder liners, C.A.V. distributor-type fuel pump, chrome molybdenum steel crankshaft with induction hardened main and big end journals, high silicon aluminium alloy flat-topped pistons, water-cooled lubricating oil cooler when required, a paper-element-type fuel filter and a 12-volt Thermostart heater in the induction manifold inlet to aid starting under cold conditions.

The makers are also offering another almost identical version, the Four 192, which has a smaller 3·5-in cylinder bore and develops 45 b.h.p. at 2,000 r.p.m. continuous rating and 58 b.h.p. at 2,400 r.p.m. for intermittent use.

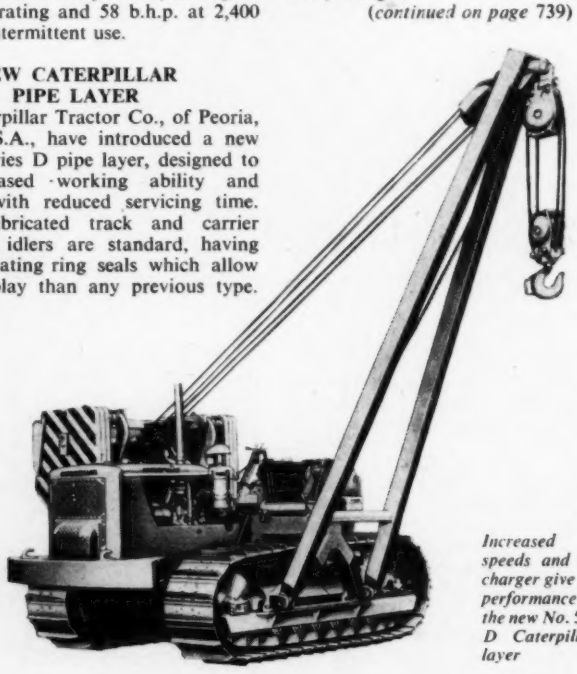
NEW CATERPILLAR PIPE LAYER

The Caterpillar Tractor Co., of Peoria, Illinois, U.S.A., have introduced a new No. 572 Series D pipe layer, designed to have increased working ability and durability with reduced servicing time. Lifetime lubricated track and carrier rollers and idlers are standard, having exclusive floating ring seals which allow more end-play than any previous type. Winch speeds have been increased for faster pipe handling. New line speeds are: first gear, 106 ft/min; second gear, 214 ft/min; third gear, 513 ft/min; and lowering speed has been increased from 222 ft/min to 230 ft/min. New transmission lubrication features are pressure-lubricated bearings, oil-sprayed gears and full-flow filtration.

An engine change is the addition of a turbocharger, increasing the fly-wheel horse power by 9·3 per cent to 140 and the torque by 80 per cent, giving greatly increased lugging ability. Engine speed has been increased from 1,200 r.p.m. to 1,240 r.p.m. to match the greater horse power to the torque converter. The Caterpillar dry-type air cleaner replaces the previous oil bath cleaner, reducing servicing time by 75 per cent and, in assuring engine protection, provides efficiency of at least 99·8 per cent during every operating hour.

The new tractor is handled in this country by the Caterpillar Tractor Co., Ltd., Glasgow.

(*continued on page* 739)



Increased winch speeds and a turbocharger give improved performance ability of the new No. 572 Series D Caterpillar pipe-layer

The Liftmaster circular lifting magnet

CIRCULAR LIFTING MAGNET

After extensive trials in steelworks and foundries over a period of four years a new circular lifting magnet is now being manufactured by Rapid Magnetic Machines, Ltd., Lombard Street, Birmingham, 12. The *Liftmaster*, as it is called, is said to have certain definite advantages over the conventional bolted design. Of welded construction and moisture-proof, it offers unusual dependability and a greater pick-up for nominal diameter. The peripheral face is completely free from projections.

For the present manufacture will be restricted to three sizes: 52 in, 62 in and 72 in, but the makers' well-known standard circular lifting magnets will continue to be produced in sizes ranging from 2 in to 76 in.

INCREASED TRACTION BATTERY POWER

The new Exide-Ironclad traction battery manufactured by Chloride Batteries, Ltd., Exide Works, Clifton Junction, Swinton, Manchester, is said to give electric trucks 35 per cent more power without increase in size, giving more work per shift or longer shifts, greater freedom in truck design, a wider field for electric truck application and, by making smaller battery compartments possible, provide opportunity for trucks to have greater manœuvrability.

The outstanding feature of the battery is the multi-tubular 'gauntlet' of resin-impregnated *Terylene* cloth slipped over the spines of CB.95 alloy of the positive plate and holding the active material in a firm but elastic grip. Besides being resistant to sulphuric acid and oxidation, the *Terylene* used has a tensile strength of over 40 tons sq. in and can sustain 80 per cent extension. It can thus accept the forces that develop without risk of fatigue or failure and yet returns to its normal state throughout its long life. It contains no corrosive agent to attack the metal of the plate spines and cause premature failure, enables electrolyte to penetrate to the active material more freely than before with negligible material shedding.

The bottom of the positive plate is a polythene moulding that ensures permanent sealing of the *Terylene* tubes and serves as an insulator not subject to corrosion. The negative plates are armoured with sleeves of *Porvic*, which eliminates the possibility of internal short circuits and enables them to meet the demands of increased output. The cell containers are moulded from specially toughened hard rubber, obviating risk of leakage and minimizing damage from road shocks, vibration and rough treatment. Combined spray arrestors and separator guards moulded in polystyrene are incorporated, and the terminal posts are efficiently sealed with rubber gaskets.

TRADE NOTES

British Electronic Achievements

The scheme for awarding annual premiums for articles on electronics, organized in the past by the Radio Industry Council (London), is now under the joint sponsorship of the Council and of the Electronic Engineering Association.

Articles published during 1959 will be considered by the panel of judges early in the New Year, and explanatory leaflets can be obtained from the Electronic Engineering Association, 11 Green Street, London, W.1, to whom also eligible articles should be submitted before the end of the year.

Six premiums of 25 guineas are offered to writers not earning their living wholly or mainly by writing. The judges, headed by Professor H. E. M. Barlow, Professor of Electrical Engineering, University College, London, are given the greatest possible freedom in allocating awards, but main factors taken into consideration are: the value of the article in making known British achievements in radio and electronics; originality of the subject; technical interest; and presentation and clarity.

Articles published abroad as well as in the United Kingdom are eligible as are articles in journals serving the many fields in which electronic methods of control and production are being increasingly used.

Conveyancer Fork Trucks, Ltd., Extend Their Activities in the Materials Handling Field

Following their policy of expanding the range of materials handling equipment sold by their subsidiary, Conveyancer Fork Trucks, Ltd., Electro-Hydraulics, Ltd., of Warrington, England, announce that they have taken over Scott Electric Vehicles, Ltd., Kidderminster.

Scott Electric Vehicles, Ltd., manufacture electric towing tractors, electric trucks, both fixed and elevating platform types, and recent design developments have resulted in the introduction of Scott Electric Trucks equipped with the E.M.I. *Robotug* (electronic guidance) control for driverless operation. A typical *Robotug* system installed at a British Railways depot is now operating with marked success, and other installations are already being planned.

The board of the new company will be as follows: chairman and managing director, C. W. Sharp; sales director, L. Rumley; production director, T. C. Wright technical director, J. D. Coldwell; secretary, R. Edwardes.

E. M. Scott will continue as manager of the company during the reorganization and subsequently he will remain with the company as consultant.

The future design, manufacture, sales and service of Scott electric trucks will extend the Conveyancer range to cover almost all aspects of materials handling. In addition to this new equipment the current range includes: petrol, diesel, turbo-transmission and electric fork lift trucks in capacities ranging from 2,000 lb to 7,000 lb flameproof and L.P. gas versions, reach trucks, attachments specially developed for all industrial applications, lifting platforms in 1 ton to 10 ton capacities, hopper loading units and the Shorland range of straddle carriers for which Conveyancer were appointed sole distributors on 1st May, 1959.

H. J. Heinz, Ltd.'s, factory at Kitt Green

In our September issue, page 510, we published an article entitled 'Conveyors in a New Food Factory' dealing with the mechanical handling equipment installed at the above factory. We must apologize that we omitted in the Appendices to give the name of the architects concerned in the building of this factory, who were J. Douglass Mathews & Partners of 3 Ebury Street, London, S.W.1, in collaboration with Skidmore, Owings & Merrill of New York. The general contractor was A. Monk & Co., Ltd.

Battery Safeguards 30 Electro-Magnets in a Shipyard

To ensure the maximum safety to their employees in new workshops where electric lifting magnets are employed, Hawthorn Leslie (Shipbuilders), Ltd., Hebburn on Tyne, have recently installed a standby battery supplied by Nife Batteries, Redditch, Worcs., to maintain current to the magnets should the main supply fail. Although 30 electro-magnets are involved, a diversity factor of 50 per cent has been allowed for.

The 220-V Nife nickel cadmium alkaline battery consists of 157 high-performance cells with a capacity of 75 Ah at the 2-hr rate of discharge. Normally the battery floats across the motor generator set which provides the supply to the magnets, and if for any reason the normal supply is interrupted the battery will continue to feed the magnets for sufficient time to enable all necessary precautions to be taken. When the motor generator set takes over the load again, the battery can be charged by raising the voltage of the generator. Because it takes up so little space the Nife battery is housed in the switchroom with the motor generator set and the control equipment.

New Overseas Subsidiary for Mono Pumps, Ltd.

Since opening their branch office in Australia, developments in the use of the products of Mono Pumps, Ltd., have justified establishing an overseas subsidiary in Australia. A new company, to be known as Mono Pumps (Australia) Pty, Ltd., has therefore been formed to foster business interests throughout Australasia.

The chairman of this new Australian subsidiary is Sir Giles Chippindall, G.B.E., who has filled many administrative posts in the Government of Australia. An Australian by birth, Sir Giles Chippindall has, in recent years, extended his valuable services to many directorships in important Australian companies including that of vice-chairman to the Trans-Australian Airlines. The managing director is G. H. Snow, who established the first branch office in Australia. R. Snape F.C.A.(Aust.), fills the post of secretary and director. Other directors are A. W. Gregory, J.P. (managing director of Mono Pumps, Ltd., London), and R. R. Kennan, A.M.I.Mech.E. (general sales manager of the London parent company). J. Hodge, who is manager of the New South Wales branch office, alternates with R. R. Kennan.

Immediate services for the Australian market are provided by the modern pump assembly works and head offices at Burwood, Melbourne, with similar facilities at Sydney.

£50,000 Arcon Contract for Engineering Works

Contracts worth over £40,000 have been placed with Taylor Woodrow (Arcon), Ltd., of Welbeck Street, London, by Ransomes & Rapier, Ltd., engineers, for the supply and erection of three steel-framed buildings at their Ipswich works.

One of the buildings is 90 ft high, specially designed to house two 60-ton cranes. This will be a heavy fabrication shop for the manufacture of the largest type of excavators, including the 1,850-ton Walking Draglines, which, with booms up to 303 ft and carrying buckets of up to 40 cu. yd., are the largest dragline excavators in the world.

Drakelow Power Station

The Central Electricity Generating Board are planning to make Drakelow Power Station the largest steam power station group project in Europe. The ultimate capacity will be 2,220 megawatts.

The old transporter and belt conveyor system is being supplemented by mobile bulk handling plant to allow flexibility in planning during the build-up period. A Michigan 175A tractor shovel fitted with a 5 cu. yd. bucket was purchased in 1958 to assist in establishing three separate stock-piles and reclaim coal into the furnace hoppers. This machine convinced the station engineers that the versatility of mobile plant had very great advantages. Now a second machine has been purchased of even larger capacity. This is the Michigan Tractor shovel model 275A fitted with an 8 cu. yd. bucket—the largest tractor shovel bucket in Europe.

These two machines have a travel speed of 27 m.p.h. and can reclaim at a rate of well over 600 tons/hr. Over a haul of 850 ft (1,750 round trip) the 275A is delivering 8 cu. yd. in 2 min 10 sec and the significance of this figure will not be lost on those companies concerned with bulk handling.

Hydrocon Highlander Cranes

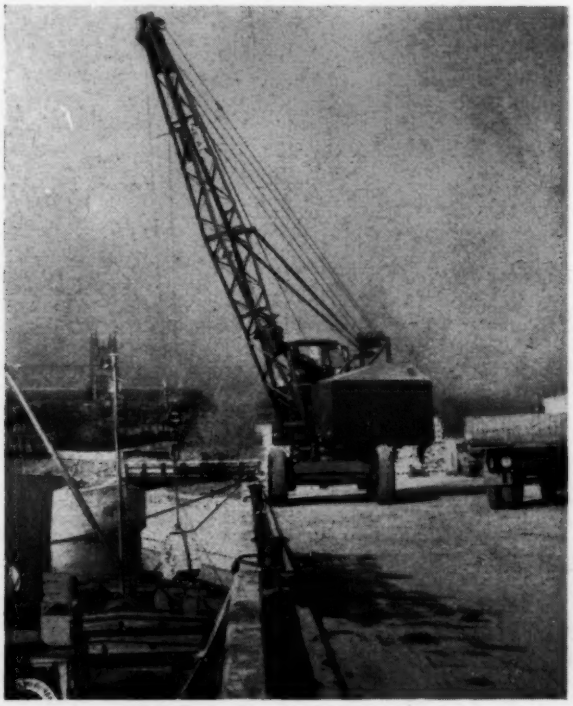
An order for six Hydrocon 'Highlander' 5-ton rotary hydraulic full-circle slewing mobile cranes has been placed with Brown & Tawse Plant, Ltd., Ambrose Street, Manchester, by British Railways, North Eastern Region, for use by the Civil Engineering Department. The Hydrocon was chosen for its simple hydraulic operation, for the precision and reliability that can be placed on hydraulic operation, and because of the high rate of utilization which can be expected from a lorry-mounted crane of this type. Seats for four men are provided in the moulded fibreglass cab. Jib lengths of 56 ft can be easily made up, and 2¼ tons is handled with spot-on precision on this jib at 15 ft radius. The four jib extension pieces are carried by the crane itself and fuel consumption figures with the Thornycroft 6-cylinder diesel engine are very good at 15 m.p.g. on the road, and 1½ gal/day when on site, using only gas oil.

Mobile Cranes for China

As a result of an approach made to the company by the Chinese some months ago R. H. Neal & Co., Ltd., mobile crane manufacturers of Ealing and Grantham, announce the signing of contracts with the Chinese People's Republic worth more than £300,000 as reported in *Mechanical Handling* November issue. These contracts are for the supply of the company's standard mobile cranes, and the total order is believed to be the largest placed by the Chinese authorities for this class of equipment anywhere in the west of Europe.

The cranes are of 6 and 15 ton capacity British rating, and will most likely, among other duties, be used in various ports. As regards future business with China, the company looks upon the market as one offering long-term prospects.

(*Continued on page* 741)



BELOW
Seen from the coal hopper at Drakelow some idea of the size of the huge bucket of the Michigan 257A tractor shovel can be gained

LEFT
An R. H. Neal mobile crane, similar to those being supplied to China

The Dempster-Dumpster System

In the article dealing with this range of container handling equipment which appeared on page 606 of our October issue the name of the licensed manufacturers should have been Powell Duffryn Engineering Co., Ltd.

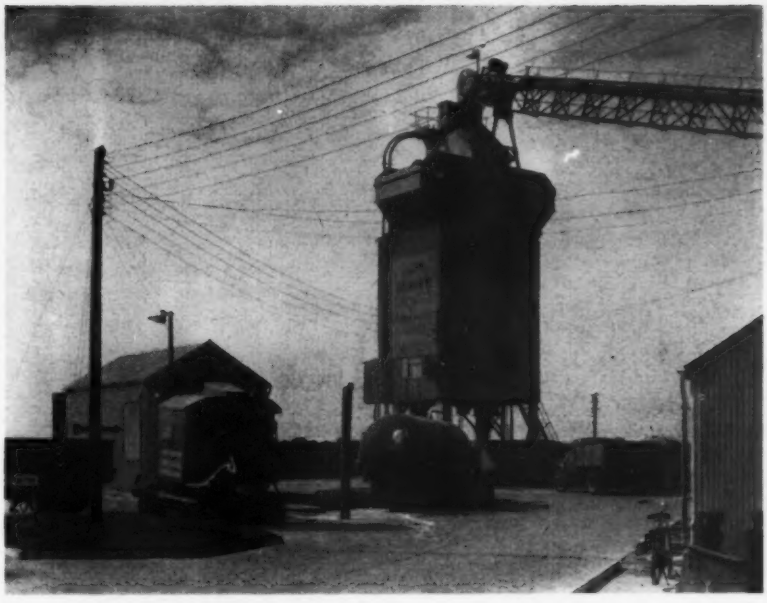
Representatives for Scotland

Varatio-Strateline Gears, Ltd., of Aberdeen Avenue, Slough, Bucks, manufacturers of the Varatio variable speed gearbox and the Strateline speed reducer, announce they have appointed Engineering Technical Services, Ltd., of 23 Brown Constable Street, Dundee, Telephone No. Dundee 3632, as their representatives for Scotland.

£120,000 Order from Australia

Elliott Brothers (London), Ltd., a member of the Elliott-Automation Group, and Siemens Edison Swan (Australia) Pty., Ltd., announce that they have received orders to a value in excess of £120,000 sterling for the supply and installation of electronic recording and control equipment for the Cockle Creek works of Sulphide Corporation, Ltd., in New South Wales.

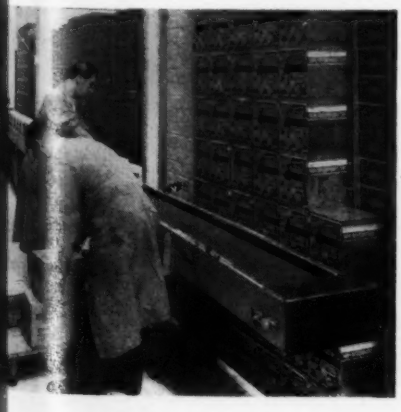
The equipment to be supplied includes a completely integrated weight control and blending system regulating the feed of materials to an I.V. Smelting Furnace. Completion of the order is called for by July 1960.



The batching and mixing plant recently opened at Farlington by John Heaver, Ltd., of Chichester

The Teantee raw material conveyor at Frears Biscuits Ltd.

A Teantee conveyor at the works of Frears Biscuits, Ltd., handling boxed biscuits out of the loading bay



Conveyors in a Biscuit Bakery

In the works of Frears Biscuits, Ltd., Teantee conveyors handle both the raw materials and the finished product.

The illustrations show one of a series of conveyors taking the boxed biscuits out to the loading bay; the conveyor shown has several special features including an 'electric eye' counting device carefully arranged so that although the conveyor is generally full with the boxes adjacent to each other, reliable counting is still effected; also the loading end of the conveyor is so arranged that when a vehicle is not available it can be used as a temporary buffer storage of biscuit boxes and an automatic arrangement is provided whereby when the loading end of the conveyor becomes quite full it is switched off.

The second illustration shows the raw material conveyor which is used for bringing in bags of flour, sugar, etc., these being required to be taken to the upper floor for feeding the various process machines; considerations of space made it necessary for this conveyor to be telescopic as well as hinged, so that it can be extended and lowered to take the packages from lorries in the yard and can be retracted and raised so as to allow traffic to pass underneath it and the existing doors to be closed.

Heavers Supplement Ready-mixed Concrete Service

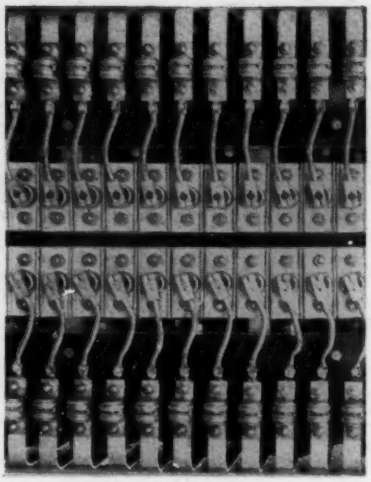
To supplement its ready-mixed concrete service to West Sussex and East Hampshire, John Heaver, Ltd., of Shopwhyke Road, Chichester, have recently installed three batching plants from Frederick Parker, Ltd., of Leicester, and are about to install a fourth.

The largest of these plants, at Farlington, near Portsmouth, and another at Chichester, have been converted to batching and mixing plants by the addition of a Swedish Turbo mixer. A third batching plant is being established at Washington, near Worthing. A fleet of 22 truck mixers will serve these plants.

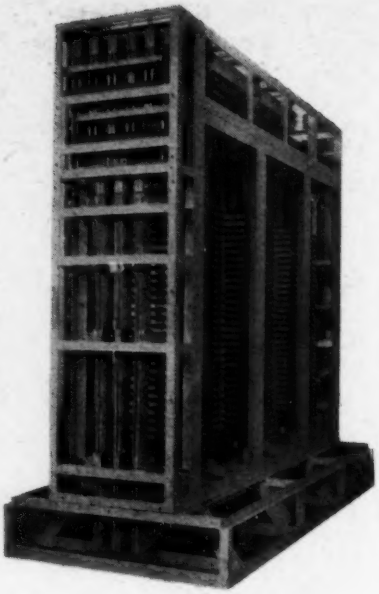
The Farlington plant, which is manually operated and has a multi-weigh system and a five compartment storage hopper, is capable of producing 600 ton/day. Various cements are available—ordinary Portland, rapid hardening, sulphate resisting or as required.

The company has incorporated several ideas of its own at Farlington. The first of these is an electrical indicator near the ground feed hopper to show the men loading the hopper how full each of the bins is. A green light shows that a bin is topped up; a red light indicates the danger level. When a full bin indication is shown, the loading operator can, by pressing a switch at the feed point, move the swinging delivery chute from the full bin to any of the others which need filling. Yet another indicator light at the point of discharge on the batching plant tells lorry drivers when to pull away after loading.

Material for the Fareham by-pass and for work at H.M.S. Dryad, Eisenhower's wartime headquarters and now a Royal Naval Torpedo School, have been supplied from the Farlington plant.



Westinghouse rectifier for India—current is evenly shared among the paralleled silicon diodes by means of equalizing reactors, thereby avoiding any necessity to select diodes of matched characteristics



The compact design of the Westinghouse silicon rectifier is illustrated by this 14,000-A 120-V cubicle which occupies a floor space of 4 ft × 6 in 12 ft 8 in

3,300-kW Silicon Rectifier Equipment for Chlorine Production

What is believed to be the largest silicon rectifier equipment made in this country to date has just been completed by Westinghouse Brake and Signal Co., Ltd., and is being shipped to India to provide current for electrolytic cells producing chlorine and caustic. The rectifier plant, which uses silicone diodes made in the Chippenham Works of Westinghouse, is rated at 27,500 A at 60-120 V D.C., and comprises a regulator and transformer connected to the 22-kV system, a water-cooled silicon rectifier, and a control cubicle with automatic adjustment of the D.C. current—so that the rate of production of chlorine is maintained constant.

The rectifier is extremely compact, a floor space of 57 sq. ft. being required for each of the two cubicles—which could be uprated to double the operating voltage by selecting silicon diodes withstanding 1,000-1,200 V peak which Westinghouse are now producing in good quantities—each diode delivering up to 10 kW.

Silicon rectifiers have been chosen on account of the high temperature; germanium offers a slightly superior efficiency below 100 V D.C. or so where the climatic conditions allow of its use. Westinghouse are building several large germanium rectifiers such as 18,000 A at 95 V for Tasmania and 14,000 A at 70 V for Holland where cool conditions prevail, while for hotter climates Westinghouse choose silicon for such contracts as 12,000 A at 110 V for Israel, 9,000 A at 80 V for Turkey, and for other plants in Pakistan employed for hydrogen production.

Skid Shovels Replace Picks and Shovels

Royal Engineers of the Army's Southern Command on detachment at Blackdown, Surrey, recently invited the manufacturers of their International Drott B-6K-3 skid shovel to demonstrate the machine's capabilities to the troops. Designed to instruct officers and men of the Plant Troop, R.E., in the versatility of modern construction equipment, the two-day course covered maintenance, job assessment and operation.

Talks and film shows were supplemented by demonstrations of the crawler's ability to carry out such tasks as digging pits, loading trucks, levelling banks and removing trees. Individual members of the Plant Troop later put their newly gained knowledge to practical test when they cleared and levelled a yard containing air-raid shelters.

In the field, the function of these crawlers is extremely wide, embracing such operations as trench digging, debris removal, road and rail construction and many other jobs formerly assigned to pick-and-shovel squads.

Increased Demand for Boxes, Pallets and Stillages

W. Groom, Ltd., established in Spalding over 150 years ago, moved to a new factory in West Marsh Road, in February, 1958. These new premises had been made necessary by the increasing demand for their products which required a much higher output. Already, however, additions have had to be made to the buildings and sales are increasing at such a rate that the alterations have been carefully planned to make further expansion a simple operation.

Since February last year the sale of timber forcing boxes, flower boxes, vegetable crates and so on has increased by over 50 per cent. In the same period sales of pallets and stillages to industries throughout the country have doubled. To meet these demands, the floor area of that part of the factory producing these articles has been increased by 40 per cent, and a new layout for existing machinery

(*Continued on page* 743)

Drott B-6K-3 skid shovel being demonstrated to the Royal Engineers

Part of two new bays which have just been completed at the works of W. Groom, Ltd.

is planned which, together with new machinery to be introduced, will make possible a greatly increased production rate at a lower cost per unit. This will ensure that Groom's products will continue to enjoy an ever widening sale in an increasingly competitive market.

The production of cardboard flower boxes, cultivating pots, strawberry punnets and other packages has steadily increased and the rear of these premises has also been extended. The additional area is being used for the storage of timber at present but it has been arranged in such a way that it will be readily available for the production of cardboard packages when required.

Another innovation has been the introduction of a non-returnable crate and box department. These are wooden boxes and crates made of lighter-weight material than normal and at a much lower cost, which enables the grower to absorb the cost of the package as part of his normal marketing costs and at the same time eliminates the expensive clerical work involved in charging the conventional type of crate and keeping a check on returns. An additional economic aspect is that the non-returnable crate releases a large number of lorries and railway wagons, normally employed in carrying empty crates and boxes back to the grower, for work of greater productive benefit to the community as a whole.

W. Groom, Ltd., have indeed made great strides since the company was founded early in the 19th century but several of the employees have seen most of the changes which have occurred, for two have served for 38 years and one for over 40 years—a record of which any man and any company might well be proud. Yet in many ways W. Groom, Ltd., feel they have just started, for the reception given to the company's products by growers, farmers and industrialists throughout the country has proved that the market for a good article, sturdily made by craftsmen to give long service at a reasonable cost, is almost limitless.

Fleet of Vans to Demonstrate New Conveyors

To deal with enquiries for their Mayrath Conveyors, Gordon Felber & Co., Ltd., of Oxford Circus, London, W.1, now have a fleet of demonstration vans.

These were introduced early this year and aroused considerable interest in a number of industries. At that time only one demonstration van was available.

Additional vehicles have now been purchased by the company and although some delay may still occur in meeting requests for demonstrations it is hoped that the current waiting list will be greatly reduced.

The Mayrath Conveyor, which consists of a 6-in dia one-piece galvanized tube carrying inside it a rotating Archimedes-type screw, is already operating satisfactorily at installations all over the country handling a wide variety of granular and free-flowing materials. Its high performance and very low price of from £45 are undoubtedly the main factors in its increasing popularity.

British Exhibition—New York—June, 1960

This will be the first comprehensive all-British exhibition and trade fair to be staged in the U.S.A.

It has the full backing of Her Britannic Majesty's Government, The Dollar Exports Council, The Federation of British Industries and the British-American Chamber of Commerce in New York and is being organized by British Overseas Fairs, Ltd. (B.O.F.). It will be held at the Coliseum Exhibition Building in the heart of New York City and will occupy all four floors. It will be nearly twice as large as the recent U.S.S.R. exhibition in the same building.

Its aim is sales—increased sales of British goods in the richest market in the world. The U.S.A. has become our biggest single market. Last year we exported $764·4 million to it. But even this was only 8 per cent of our total exports. Our aim is to hit $1 billion in 1960 and go on increasing the total year after year. We have only begun to tap the vast potential of this immensely wealthy market.

Its further aim is to publicize and boost the prestige of Britain and British industry throughout the North American continent.

RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

PASSENGER CONVEYOR
Hewitt Robins Inc., of Connecticut.—U.K. 815661.

The continuous standing surface for people has a smooth motion and takes horizontal curves, using a roll-over turn for return path.

STACKER
Worcester Automatic Machine Co., of Massachusetts.—U.K. 815684.

For milk bottle cases stacked in refrigerator room using the handler which is simple, cheap, and needs no building alterations to accommodate it.

POWDER FEED
E. A. Wahl, of New Jersey.—U.K. 815691.

Continuous feed for granules, powder, etc., at preset constant volume rate, e.g. for chemicals in water supplies, using a hopper feeding an auger tube which is vibrated, being more rugged and accurate than usual.

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THE PUBLISHING DEPT.
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CONVEYOR BLADES
T. Mayrath, of Dodge City.—U.K. 815872.

Machine for making helical conveyor blades from strip metal with higher working curvature.

PULVERULENT DISCHARGE
Vacu Blast, Ltd.—U.K. 815882.

Powder discharge from lorries, hoppers, etc., e.g. cement, using a lower air ratio by injecting it over the lower outlet cone surface to keep just that part fluidized.

CONVEYOR BELT
Goodyear Tire & Rubber Co., of Akron.—U.K. 815910.

A high-impact-resistance design, for use with slag and rock, with a breaker structure on one or both sides may have up to 16 layers in all, with the cords at various angles.

JIB CRANE
Orenstein Koppel und Lübecker Maschinenbau A.G., of Berlin.—U.K. 815945.

Design with all the clutches, gears, slewing, luffing and hoist mechanism in

one oil-filled housing which can be replaced as a unit for repair, etc.

SACK GRABS
D. H. Coates, of Hull.—U.K. 815998.

Pick-up grab for catching full sacks by the neck, using spring-loaded jaws. Can be mounted on a tractor elevator.

COKE WASHING
A. L. Jennings, of Cleckheaton.—U.K. 816009.

Plant of circular form with cone-shaped bottom having a fan to upwell water, giving a flotation separation of coke from clinker in double-walled tank.

PNEUMATIC CONVEYOR
Charrold, Ltd.—U.K. 816013.

Controlled feed rate to pneumatic conveyor, without air escape, to reduce abrasion, is achieved by using pistons and pockets, thus avoiding direct access.

FORK TRUCK
C. K. Fitch, of Haywards Heath.—U.K. 816058.

Design somewhat as per patent 783452 but with adjustment linearly in direction of arms, i.e. a fore-and-aft movement.

POWER TRUCK
Yale & Towne Manufacturing Co., of New York. —U.K. 816097.

Outlines a multiple lift truck with the pistons or cylinders having connections between the moving uprights to keep them vertically aligned.

COKE OVEN CONTROL
Woodall Duckham Construction Co., Ltd.— U.K. 816114.

Interlock control for horizontal coke oven rams, to ensure proper position of quench car and appropriate switches.

BUCKET ELEVATOR
Triplejoy Equipment Pty. Ltd., of Johannesburg. —U.K. 816128.

On a motorized chassis with a pivoted boom for adjustment to any angle and for feeding into a discharge lorry.

CONVEYOR TRANSFER
Aktieselskabet Brodrene Hartmann, of Denmark. —U.K. 816166.

Egg trays, etc., may be swung from hanging conveyor, by rocking sloping surface on to normal conveyor at right angles.

FLOW CONTROL
W. Ross, of Surbiton.—U.K. 816173.

For ore, coal, etc., control on inclined surfaces by flexible aprons of endless chains which lie heavily across the path. A drum drives these chains without erking, since they lie across it at an angle.

GRAB
Braithwaite & Co. Engineers, Ltd., of Bookham. —U.K. 816175.

A boring and excavating grab with given form of jaw design and opening and control mechanism.

SILAGE CONVEYOR
Gebr. Welger, of Germany.—U.K. 816183.

Baler pick-up which is cheaper, using swinging packing fork and spiked endless belt feed.

MINING CONVEYOR
Demag A.G., of Duisberg.—U.K. 816192.

Velocity is varied but torque kept constant using two squirrel-cage motors operating epicyclic gear.

ROLLER TRACK
Gutehoffnungshütte Sterkrade A.G., of Oberhausen.—U.K. 816291.

Conveyor rollers for use in mining, somewhat as per patents 170265, 756773, but avoiding jolting at rail joints by using inserts of given shape giving a gradual transition.

TIPPLER
Joseph Sankey & Sons, Ltd., of Bilston.—U.K. 816349.

Lorries with rear drop sides of given form having posts and stanchions with common pivots and a safety device.

PERVIOUS CONVEYORS
R. Halstrick, of Westphalia.—U.K. 816362.

Furnace grates and ore treatment, e.g. vibrator-conveyors are made from plates with projections and holes in a given array of several layers of plates.

POWDER FEED
E. A. Wahl, of New Jersey.—U.K. 816363.

Granule feed of uniform rate even for sticky materials such as zinc stearate and titanium dioxide, somewhat as per patent 815691 but with sharp tapping of the vertical auger to prevent adhesion.

DIGGER LOADER
Aldridge & Ranken, Ltd.—U.K. 816393.

Tractor mounted for lorry loading, using pivoted arms allowing rotating and tilting.

BOX COVERING
National Dairy Products Corporation, of New York.—U.K. 816462.

A form of conveyorized feed to machine for telescopically joining a box and its cover.

EXCAVATOR GRAPPLE
Joy Manufacturing Co., Canada, Ltd.—U.K. 816486.

For ore and muck removal in vertical mining, with avoidance of fall-over troubles and reduced piston rod breakage when cable slackens, by use of a new-type tine support.

PULP HANDLING
Diamond Match Co., of New York.—U.K. 816492.

Drive and index arrangements for intermittent-acting pulp machine making egg cartons and separators, using, initially, a circular path device with suction pick-up of pulp and initial drying. This is followed by a hot drying die conveyor fed by an air-blast transfer device, the whole being cheaper and of better synchronism.

LAMINATED BELT
Pneumatiques & Caoutchouc Manufacture Kleber Colombes, of France.—U.K. 816505.

Wire- or cable-reinforced conveyor belt—to avoid undue thickness of textile types and humidity effects when surface is exposed.

MIXER
F. H. Rumcke, of Westphalia.—U.K. 816555.

A kneader for ceramic materials, dyes, granules, etc., using a screw conveyor which is simple in design, and which reverses for extraction.

TIMBER LIFT
Quiggin & Co., Ltd., of Douglas.—U.K. 816566.

Avoids use of rope slings for stacks of cut wood; uses yokes and crane hooks with pulleys and swivel block systems.

ROLLER SUPPORTS
Richard Sutcliffe, Ltd., of Wakefield.—U.K. 816701.

Conveyor roller design with bearings in the ends having piston ring seals.

CABLE GUIDE
Redler Conveyors, Ltd., of Stroud.—U.K. 816724.

Improved patent 779312 for drag shove cable guides to allow for variable angle of incoming cable, using a pivoted guide allowing rotation of the base plate round a vertical axis, and avoiding undue abrasion.

ROTARY FEED
Metals Disintegrating Co., of New Jersey.— U.K. 816726.

Rotating hopper and table feeding an inclined chute under controlled conditions by means of edge grooves catching rolling pellets, etc., then deflecting them with sprung deflector at proper spot.

FURNACE FEED
N. V. Stoakwerk, of Holland.—U.K. 816745.

Coal, etc., evenly fed to furnace via a conduit in the crown, with an outward throw by a gyratory air current over a ribbed cone initially fed by a screw conveyor.

CULTURE DRYING
Mitchell Engineering, Ltd., of Peterborough.— U.K. 816794.

Conveyor for dehydrating sensitive materials in thin films, heated from both sides, with variable radiation sources.

BALLAST TAMPING
S. R. Hursh et alia, of Pittsburgh.—U.K. 816862.

Rail track maintenance equipment which can also raise the track by jacks, using less crew.

ROPE LUBRICANT
N. V. de B. P. Maatschappij, of The Hague.— U.K. 816904.

For use with lift and crane wire ropes which is light coloured, anti-corrosive and of long life under extreme loads and temperatures. It consists of 30 per cent each petrolatum and lanoline, 7 per cent alkali naphtha sulphonate about 27 per cent gasoline and 3 per cent diacetone alcohol.

TOPPING WINCH
Scharffe & Co., of Hamburg.—U.K. 816969.

A more reliable derrick winch for ship use with safety device so that it only moves when unladen, due to low power of driving motor.

CONVEYOR TRAIN
Untertage Maschinenbau G.m.b.H., of Recklinghausen.—U.K. 816978.

Train for mines use, with flexible ball-and-socket coupling, which can be cable hauled or separately powered.

DOUGH DIVIDER
Kooperativa Forbindet Ekonomisk Forening, of Sweden.—U.K. 817022.

Rotating device with movable slide for measuring off and then discharging a given quantity of dough in bakeries.

BOTTLE LOADER
I. D. Glazer, of Dallas.—U.K. 817064.

A loader for bottle carriers, e.g. of soft drinks, holding them by the necks and forcing part of the carrier down over them, working in a conveyorized plant